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Some Domed Interiors, illustrating Mr. Bolton's Paper at the Architectural Association ..... *Double-Page Ink-Photo.*

Plans and Sections of Domed Churches, illustrating Mr. Bolton's Paper at the Architectural Association ..... *Two Double-Page Photo-Lithos.*

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The Dome in Modern Architecture.

THE paper read by Mr. A. T. Bolton last week at the Architectural Association, on "The Dome as the basis of Architectural Design," was a very remarkable one, both for the amount of observation and suggestion contained in it, and the energy and industry displayed in the production of such a number of plans and sections of domed churches, mostly from measurements by the author. We had an opportunity of seeing these diagrams some time previous to the reading of the paper, and immediately decided that it was worth while to make arrangements for reproducing the whole set on a reduced scale to accompany the paper.

Where perhaps the paper did not exactly answer to the suggestion implied in its title was that it was rather a critical survey of the methods of the past—not without moral lessons from these, it is true—than an indication of the line that should be taken in the future treatment and development of the dome; and this, to our thinking, is the point of paramount interest to modern architects.

We have always held the opinion that the dome is the most sublime architectural feature invented by man, and that more may be done with it in architecture than has ever yet been done; and it has the practical merit also of being an exceedingly sound, monumental, and stable method of roofing, so that, as Fergusson put it, "it is almost as difficult to build a dome that will fall as a vault that will not"; which, allowing a little for picturesque antithesis, is fairly true. The vault has constantly driven its executants into "fudging;" whereas a dome is logical, complete, rational throughout. A dome on a large scale, too, has not only a kind of cosmical symbolism derived from its spherical form, but it has another hold over the poetic element in our minds by its glorious inutility. It is the last form that any one would think of using, for instance, for producing good acoustic results; and accordingly, when we see a church roofed with a great dome, we at once instinctively feel that we have soared above the commonplaces of utilitarianism, and are in a building formed especially for contemplation and aspiration.

Mr. Bolton, in his paper, intentionally omits the typical domical buildings, those of which the leading feature is a great dome covering the greater portion of the area—such buildings as St. Sophia, St. Peter's, and St. Paul's, as they were familiar to all and had been sufficiently discussed; his object being to consider the dome as a general method of roofing affecting the general design of the building. This was quite a reasonable line to take for the purposes of his paper; nevertheless, it is in the great central dome as the principal covering of the area that the real majesty and symbolism of this architectural feature are fully to be found. The great difficulty with it is to reconcile internal and external effect. The dome is to our thinking as fine a feature externally as internally; only it is difficult to make the same dome equally effective in both capacities. It has perhaps been better done at St. Peter's than in any other great church; but even here the dome is too high internally for its full effect. An external dome requires height for its effect, or it is lost as soon as you get at all near the building; an internal dome loses in interior effect, beyond a certain point, almost in proportion to its height, its effect being lessened by perspective. St. Paul's is the only great church in which the external and internal effect of the dome are equally good, and at what cost that result is gained we all know.* The greatest effect from a monumental dome, honestly built in masonry and with the same lines (approximately) externally and internally, can only be regarded as an interior effect: or the external effect can only be satisfactory in the case of a design which is essentially low and horizontal in character. The essential character of the dome is space, not height. The solution of the dilemma is, perhaps, that the internal effect, and the monumental unity of structure, are worth the sacrifice of the soaring exterior effect.

The question of vertical ribs or divisions in the design of a dome has been often touched upon. Externally such a treatment has something to recommend it, in that it slightly counteracts the effect of lowness on the exterior, and if there is a lantern or other crowning feature, gives leading lines up to it which are of value both structurally and æsthetically. But in the interior we hold that all suggestion of vertical ribs or compartments at once destroys its poetry. Part of the suggestiveness of the domed roof lies in its imitation of, or symbolism of, the apparent dome of the sky—the most sublime appearance which nature presents to the eye. To this is to be added the feeling of perfection and infiniteness belonging to the form of the uninterrupted sphere, or in this case hemisphere. With an unbroken concave surface the interior dome seems to hang in the air over us, a kind of emblem of eternity; break up its surface with vertical ribs, and it at once becomes a mere construction; its mystery is gone. And for the same reason the decoration of a dome, however it may have to be temporarily lined out on converging meridians in the course of its execution, for the purpose of accurate setting out, should when completed have the effect of spreading equally over the whole surface, not attracting the eye to any one point more than another. It may be a question, however, whether such a dome, on a large scale, should be decorated at all. There are few forms of decoration which will not rob it of something of its aërial mystery. In St. Paul's dome, at present, Thornhill's well-intended paintings are scarcely noticeable; the dome is lost in a misty half-light, cut across,

* There is another way in which it might be done; viz.: by stopping the lower dome half-way up its height, finishing it there so as to leave a large circular opening; this half-dome would be accepted by the eye as the ceiling of the interior, and prevent the impression of undue height, while through the opening, and far above it, would be seen the inner surface of the exterior dome, also of solid masonry, with a possible very beautiful effect. This is in fact something like what is done at the Invalides, only there the second dome is still not the ultimate exterior one. This would probably be even worse for acoustics, but we admit already to having soared beyond acoustics.

when there is sunshine, by straight bars of light. If a decoration be carried out there which will be visible to every eye, will not a great deal of the effect of the dome be destroyed by thus accentuating its surface, and destroying its effect of mystery, space, and distance?

Mr. Bolton's division of his subject into plans which represent the mediæval church with domes applied, and square plans which seem specially meant for domical roofing, is a good and instructive one, and almost inevitable when considering the subject historically. The result of the comparison of these plans must surely be to confirm the idea that the dome is a form of covering especially suited to square, and not to long plans. With the long plan the difficulty always comes in, that viewing the building in perspective we see so little of the domes; they are a series of openings in the ceiling of which we do not see the termination. And one of the difficulties with the dome, even in a wide and square building, is that from some positions outside of its circle we see so little of it. Hence the phenomenon often seen in perspective views of domed interiors, where the dome seems to be canted to one side from the draughtsman's effort to represent more of it than we could possibly see in the actual building from the point of sight assumed in the drawing. Saucer-shaped domes, of low section, to some extent escape this defect, and form a very effective roof in subordinate positions, as well as presenting excellent surfaces for decorative treatment.

When we come to consider the dome not so much as one predominant feature, but as a system of roofing to be applied to every compartment of a building which is broken up into compartments, we must still think that it is more suited to a square than a long plan, and suggests the former. A compartment to be covered by a dome rising from it by a natural constructional sequence must be square in its main proportions; in actual lines it may be square, circular, or octagonal, but its two axes must be the same length; and hence the feature itself seems structurally to suggest square proportions. The grouping of domical coverings over the different compartments, and their arrangement on plan and section, is capable of many variations; some very good ones are seen in Mr. Bolton's collection of plans of "Type II." Leonardo da Vinci left among his sketches some fine suggestions in a very rough form; especially one remarkable plan (given in plate xci. of Baron de Geymuller's "Leonardo da Vinci as Architect"), with radiating square chapels around a central domed compartment, arranged in a very ingenious and effective manner. It would be a good subject for the Tite Prize if the Institute were to place this small sketch-plan in the hands of students, with liberty to amplify or modify it in detail, and compete for the best treatment of it in the Italian style of architecture, which is the special object of the prize.

If, however, we are to endeavour to work out the fuller adoption of the dome as a principle of construction in modern buildings, it almost seems that the first thing we must do must be to endeavour to forget the Italian style. From the fact that the principal development of domed buildings took place in the Renaissance period, the dome has become so associated in our minds with that style that we can scarcely see a dome without expecting to see a pilastered pier under it and a modillion cornice carried round its springing line. It is almost necessary to rub the eyes of our mind and remember that these things have no necessary association with the dome. If we could shake these details off and begin springing domes from bare walls and piers in the first instance, we should very soon find that some other features of decoration than applied pilasters would go equally well with them—perhaps even better; and we might find ourselves on the threshold of a new style of domical architecture.

REPORTS ON SEWAGE EXPERIMENTS IN LONDON AND MANCHESTER.

IN the present state of our knowledge, it is a comparatively easy matter to design a scheme of sewage purification on a small scale, which shall give satisfactory results, and which shall not be too costly either in construction or maintenance; but it is not so easy to determine what scheme is most suitable for our large cities. A system of purification which may be not only economical, but chemically and biologically satisfactory, when applied to the sewage of a village of a thousand inhabitants, cannot always be multiplied a thousandfold, and made applicable to a population of a million. For example, it is usually possible to obtain eight or ten acres of suitable land to purify the sewage of a thousand persons by broad irrigation, but it is often absolutely impossible to obtain the eight or ten thousand acres which would be required for the city of a million inhabitants. Birmingham, with a population of about 650,000 (including the adjacent districts), has a sewage farm of over 1,200 acres, and finds it much too small for the adequate disposal of the sewage, even though the sewage is first treated chemically and though the land is eminently suitable for irrigation. Other cities, however, are not so fortunately placed as Birmingham in regard to the nature of the surrounding land, Manchester being among the number. In the case of London also, irrigation is impracticable, for it would require a farm of forty thousand acres, or about sixty square miles.

London and Manchester have other points in common. Both cities at present treat their sewage by chemical precipitation, both convey the sludge out to sea, both pass the tank-effluent without adequate purification into important waterways, both have appointed experts to advise them as to the best methods of securing a greater degree of purification at a reasonable cost, and—to complete the parallel—the reports of these experts have been issued almost at the same time, and both reports are strongly in favour of bacterial treatment without chemicals. The London experts were two—a chemist, Dr. Clowes, and a bacteriologist, Dr. Houston. The Manchester experts were three—a chemist, a bacteriologist, and an engineer—Messrs. Percy F. Frankland, W. H. Perkin, jun., and Baldwin Latham.

The Reports in both cases record the results of many experiments carried out on a sufficiently large scale, and are illustrated by a number of diagrams showing graphically the purification effected under various conditions. In the main the same problem was considered in each case—how to purify large volumes of sewage adequately and economically. But in some important particulars the Reports are supplementary to each other; thus, the Manchester Report, which does not contain one word as to the nature and number of the bacteria and spores either in the crude sewage or in the effluent, is supplemented by Dr. Houston's elaborate (though, it must be confessed, indefinitive) monograph on the subject; and the important experiments made by the Manchester experts, on the treatment of storm-water, valuably supplement the information in the London report. Then again, the experiments in Manchester appear to have been made with filter-beds only 3 ft. and 4 ft. deep, but Dr. Clowes has worked with beds of widely different depths—4 ft., 6 ft., and 13 ft.—with a view to economy in the area of land, and has attained results which go far to show that the deeper the filter the greater will be the volume of sewage purified. In London, crude sewage only was filtered; in Manchester, experiments were made in the filtration both of crude sewage, and of the effluent from tanks in which a preliminary purification had been effected without the use of chemicals. It will be best, therefore, to consider the two Reports together, after briefly alluding to the facts that the Manchester experts have come to the conclusion that the culvert scheme, on which they were asked to report, cannot be recommended, that land-treatment is impracticable on account of the unsuitable nature of the land at Davyhulme (where the Manchester sewage outfall is situated), that chemical treatment is unnecessary, and that bacterial treatment on proper lines will yield an effluent which will conform to the somewhat high standard fixed by the Manchester and Irwell joint committee, and which will, indeed, be purer than the water of the Ship Canal into which it flows.

The filtering material is a most important consideration. Coke was used in the London experiments, but in Manchester both coke and cinders were tried, and cinders in almost every case gave better results. In London the pieces of coke were, as nearly as possible, of equal size—about as large as walnuts. Dr. Clowes claims that filtering material of this sort has the following advantages over material of finer grade: It allows the bed to be more rapidly filled and emptied, to be more completely emptied and aërated, and to hold a larger volume of sewage. The latter point is important, because the net capacity of the bed is a measure of the quantity of sewage that can be purified. "The beds now in use," he writes, "had an original capacity for sewage, which was nearly equal to the volume of the coke which they contained, in place of only 20 or 30 per cent. of that volume, as is shown by beds containing smaller coke." This is a Delphic utterance, the exact meaning of which we confess ourselves unable to fathom. The unprofessional reader, such as the average London County Councillor for whose consideration the Report has been prepared, would probably consider the phrase, "the volume of the coke," to be synonymous with the capacity of the empty tank, but this cannot be Dr. Clowes's meaning, as it would imply that the coke has no substance worth mentioning, seeing that the capacity for sewage is "nearly equal" to the volume of the coke. The word "volume" must

therefore be used in the technical sense, and must refer to the *net* volume after deducting all cavities in and between the material. This gives us to understand that, if a tank with a gross capacity of 400 cubic feet be filled with coke in pieces of the size of walnuts, 200 cubic feet will *originally* be occupied by the substance of the coke, and the other 200 cubic feet (or "nearly" so) will be the space available for sewage. This is in accord with common experience. But in the latter half of the statement we are told that smaller coke will give a capacity of "only 20 or 30 per cent. of *that* volume." Does this refer to the volume of coke of the larger size or of the smaller? If the former, the tank of 400 cubic ft. will have a sewage capacity of only 40 or 60 cubic ft.—that is to say, of 10 or 15 per cent.; if, however, it refers to the actual volume of the smaller coke, the sewage capacity will be about 66 or 93 cubic ft.—that is to say, about 16·5 or 23·3 per cent. of the gross capacity of the tank—but what Councillor can be expected to calculate this for himself? Moreover, it is somewhat misleading to give only the "original" capacity for sewage, as filter-beds invariably settle when repeatedly filled and emptied—often as much as 5 per cent. It would have been interesting to know the amount of this settlement in the case of beds filled with coke of uniform size.

Dr. Clowes states that the capacity of the 4-ft. bed was reduced in about twelve months "from 50 to 33 per cent. of the whole volume of the bed," but does not mention the settlement of the material as having anything to do with this; on the contrary, he considers it "to be mainly due to fragments of straw and chaff . . . and to woody fibre."

The Manchester experiments in these points are clear, and show that Dr. Clowes's unsupported statement as to the small capacity of fine-grade filters must be taken with the proverbial grain of salt. One tank filled with coke, which had passed a 3-in. mesh and had been rejected by a 1-in. mesh, had an "original" capacity for sewage equal to 53 per cent. of the tank capacity. Exactly the same result was given by coke which had passed a 1-in. mesh and had been rejected by a ½-in. mesh. And the worst results which were obtained showed an original capacity for sewage equal to about 42 per cent. of the tank capacity, which is very different from Dr. Clowes's figures. Indeed, the conclusion arrived at by the three Manchester experts is "that the original capacity of a contact-bed is practically uninfluenced by the grade of material with which the bed is filled." After use for a short time the capacity for sewage was found to be reduced, but the ultimate average capacity for sewage was found to be (for four filters containing different grades of materials) 39, 36, 32, and 31 per cent. of the tank capacity. Two of these tanks at the end of two years' working had a sewage capacity of about 30 per cent., and this remained practically constant for two years more; that is to say, up to the time of the preparation of the experts' Report. The best grade of material is considered by the Manchester experts to lie between 1½ in. and ⅝ in.

Dr. Clowes's experiments on different depths of filtering material are decidedly interesting. From them he draws the conclusion that "coke-beds similar in character, but differing in depth, have been found to give practically identical purifying effects." From another part of the Report we gather that this statement requires the important addition that the quantity of sewage treated is at first directly proportional to the depth of the bed. Thus, the 4-ft. bed (with two fillings a day) purified sewage at the rate of 1,100,000 gallons per day per acre, and the 6-ft. bed purified 1,665,000 gallons. These figures were considerably reduced after the beds had been in use for some time, and the ratio between depth and flow did not then hold good; but Dr. Clowes declared that "if the satisfactory working of the 13-ft. bed is maintained, it will treat a volume of raw sewage equal to, at least, three and a half million gallons per day" (per acre). This is a point worth consideration in Manchester. As regards the benefit of a second filtration, the two Reports are agreed. Dr. Clowes found that the first filtration removed all suspended matters, and about 50 per cent. of the dissolved impurities, and that a second filtration effected "an additional purification of about 19·3 per cent." The Manchester experts report that "for obtaining a high degree of efficiency in the bacterial purification of sewage, a system of multiple contact is generally necessary; thus it may be taken broadly that in the first contact 50 per cent. of the dissolved impurity is removed, and that in the second contact 50 per cent. of the impurity still remaining in the effluent is disposed of, and so on." The same agreement characterises the two Reports on the important subject of trade effluents. Dr. Houston states that these waste products, which are discharged in large quantities into the London sewers, "do not inhibit the growth of the sewage bacteria to any marked extent." The three Manchester experts "are of opinion that only in very exceptional cases can trade refuse be present in ordinary town sewage in such proportion as to affect the bacterial processes of purification."

The closed "septic" tank was tested at Manchester, but was not found to have any advantages over an open tank, the two giving "practically identical" results. The most important recommendations of the Manchester experts may be briefly summarised as follows:—

1. The sewage must be screened on arrival at the works;
2. It must then be passed through open tanks provided with scum-boards and submerged walls;
3. The tank effluents must be twice filtered, the filter beds to be 3 ft. 4 in. deep, and the filtering clinkers must not exceed 1½ in., or be less than ⅛ in. in diameter;
4. Storm water must be run through "roughing tanks" and then passed through "specially prepared bacteria-beds.

The total area of the filter-beds recommended by the experts is 60 acres for the treatment of the ordinary sewage, and "at least 25 acres" for storm water. These will require about half a million cubic yards of coke, and the question may well be asked, Where and when can it be obtained?

There can be no doubt that the two Reports which we have just discussed will have far-reaching consequences. They cannot, of course, claim the importance of the epoch-making experiments in Massachusetts, but they add considerably to our knowledge and are specially noteworthy on account of the importance of the cities to which they relate. If London and Manchester pin their faith to the bacterial purification of sewage—and, after the conclusive Report of the three experts, we do not see how Manchester, at least, can do otherwise — hundreds of smaller towns and cities are sure to do the same. The advantages of the system are obvious; no chemicals are necessary, the area of land required is reduced to the smallest proportions, a large degree of purification can be obtained, and sludge is almost non-existing. One word of warning, however, must be given: great care in management is necessary. A filter-bed will give good or bad results, according as it is well or badly managed. If it be overworked—and this may easily occur before it is fully matured—a foul effluent will be the inevitable result. On the other hand, a fully-matured bed will purify four fillings of tank effluent a day, provided that adequate periods of rest are allowed at intervals—say one day's rest a week—and that the bed is well aërated between the fillings.

NOTES.

The Workmen's Compensation Act.

THE number of appeals set down for hearing in the sittings which began last week—under the Workmen's Compensation Act — is thirty-eight. At the beginning of the Michaelmas sittings there were thirty-two. A number of the appeals included in the list for the current sittings were set down for hearing in the previous sittings. It is the business of the Government and the judges to see that proper facilities are given for the hearing of these appeals. At present there is too long a delay. Thus in the first appeal the award was given so long ago as June 19, in the second the date is June 21. It is a hardship upon suitors under the Act that workmen and employers should have to wait so long for a final decision. Some years ago business men managed to obtain for themselves a special "Commercial Court"; it is difficult to understand why well-to-do business men are to have special facilities for the conclusion of litigation, and not workmen and employers whose disputes have to come before the Court of Appeal.

Underground London.

THE completion of the Mansion House subway, the approaching completion also of the Central London Railway, are all signs of the creation of an underground London. It is obvious that a huge city such as London must sooner or later develop its locomotion under ground or in the air, and the time may come when underground London will be as much in existence as that which now exists on the surface. Such railways as the overhead railways of New York and Liverpool show the development in one way. In London the development is below the surface. It is possible also that in time subterranean dwellings, probably for business purposes, will be created. But we must certainly expect in the immediate future a very rapid development of underground London. New streets and new buildings above ground must arise, but it is clear that contemporaneously there will be a new underground London called into existence.

Euston Station.

THE announcement that the London and North-Western Railway Company have lodged a Bill for the purpose of the enlargement of

Euston Station has not come too soon. For a long time Euston Station has been altogether inadequate for the traffic of the line. It is surprising, indeed, that the Board of the company have not taken the matter in hand before. They are not hampered as some other companies are for want of space; there is a great area of land facing the Euston-road which can be utilised for the purpose of a new station. It is a misplaced economy to delay such improvements, since land which has to be compulsorily taken increases every year in value in the Metropolis. We suspect that had the London and North-Western Railway Company built a new station ten years ago, they would have saved money by so doing. This company is rightly regarded as the first railway company in England, and it is to be hoped that the new station will be worthy of the line. It must be confessed that in regard to stations this company has been very conservative. No attempts have been made to light and to warm Euston Station as it should be. A large railway company is as slow to move as a Government Department.

The Leeds Explosion.

MODERN ingenuity has succeeded in producing machines so wonderfully exemplifying mechanical effort, that there is a tendency to forget the physical potentialities slumbering around us and beneath our feet. Of these forces, and of their irresistible nature, we are occasionally only too well reminded by some regrettable accident, such as the recent explosion at the Leeds Steel Works, where three men were killed, and twenty were more or less seriously injured. The cause of the disaster seems to have been the explosion of accumulated gases in one of three cupolas used at the works, the immediate effects being to carry away the bell and hopper, and to blow out a large quantity of incandescent fuel and molten iron. As showing the intensity of the force manifested, it may be mentioned that two of the injured men were hurled to a distance of some 65 ft., whilst large fragments of metal thrown upon the engine-house resulted in its total demolition. At the inquest, which was opened last week, the coroner remarked that there appeared to have been no negligence on the part of the *employés*, nor had there been any breakdown in the appliances. So far as we are informed, the furnace was of the most approved type, and the Steel Works Company themselves will no doubt welcome the scientific inquiry which must be made.

Swiss Electrical Engineering.

THE Institution of Electrical Engineers discussed last week the Report of the Committee on their recent visit to Switzerland. Mr. Crompton stated that what struck him more than anything else in Swiss engineering practice was the unexpected simplicity of three-phase working for electric railways. In this country the ordinary practice is to use three-phase currents for transmission to a distance, and then by means of rotary converters to turn them into direct currents. The Swiss have shown that this is unnecessary. Three-phase motors are quite as efficient as direct-current motors, and seem better able to stand rough usage. The engineer to a very successful Swiss Railway expressed great surprise that it was thought necessary to convert the alternating current to direct current in the new Central London Railway. Several other speakers agreed with him, and no one attempted to defend a practice which, although it may be advisable in an overhead tramway system like the one at Dublin, seems to entail needless expense in an underground railway. Mr. Hammond pointed out that too much importance had been attached by English engineers as to the effect of cheap water-power on the development of electrical industries in Switzerland. They were so impressed by the magnitude of some of the water-power installations like the one at Rheinfelden, where the turbines developed 16,000 h.p., that they were apt to forget that the cost of power was, after all, only a fraction of the total cost of generating electric energy. In England we have cheap coal, so that even if we had coal for nothing it would not make much difference in the cost of electricity. At Kensington the cost of generating a unit is 3d., but only 25 per cent. of this total cost is due to the coal. Hence, if coal cost nothing, the cost price of the unit would only be reduced from 3d. to 2¼d. Mr. Swinburne said that what struck him most when he went into an engineer's office in a Continental works was to see nearly all the home and foreign technical journals lying on his table. Foreign engineers seemed anxious to have the best of everything, and judged new inventions with an open mind. They were not, like our engineers, anxious to stamp their designs with their own individuality; their aim was simply to make them as good as possible. This led to uniformity in practice and a rapid development of the industry.

An Electric Lamp Danger.

MR. G. C. T. BARTLEY, M.P., has met with an unfortunate accident owing to the explosion of a glow-lamp. In a letter to the *Times* of Friday last week he describes the accident and warns users of the light to put some protection round the lamps which they use close to their faces. It seems that Mr. Bartley was turning on the light on his study table when the lamp exploded, its socket being blown out and the glass being sent in all directions "in myriads of atoms." Mr. Bartley says that the shade of the lamp saved his face, but unfortunately he received some dust in one eye which confined him to his room for several days and prevented him from reading. The lamp was a new one, supplied by the Westminster Company when they doubled the pressure of his supply a few weeks ago. From the somewhat scanty details given we can only guess at what happened. Inside a glow-lamp there is a very high vacuum, so when it is broken, the glass, which is exceedingly thin, collapses inwards, and pieces of the glass which escape hitting other pieces of glass sometimes fly a few yards. This, however, would not blow out the socket. It seems probable that for some reason or other (probably owing to the higher voltage) an arc started across the lamp terminals, and the socket and holder fitting closely together, the heated air could not get away rapidly enough, and so the lamp was literally fired out of its socket and collapsed on meeting the first obstacle. The force of the explosion would blow out the arc. This is the only explanation we can offer. An explosion of the same kind could have been produced by lightning, and to this we attributed a somewhat similar occurrence in the City a few years ago.

Reid's Brewery, Clerkenwell-road.

MESSRS. HORNE & CO. auctioneers, acting in conjunction with Messrs. Chinnock, Galsworthy, & Chinnock, have recently concluded, on behalf of the directors of Messrs. Watney, Combe, Reid, & Co., the last of an important series of sales of freehold property, situated in Clerkenwell-road, Portpool-lane, Leather-lane, Hatton-wall, and Gray's Inn-road. Within that area are the premises, having their main frontage in Clerkenwell-road (formerly Liquorpond-street), of Reid's Brewery, for which that firm have no longer any use, having incorporated their business with those of Combe's and Watney's. Reid's Brewery, previously Meux's, represented a business which, it is said, was originally established in Liquorpond-street nearly three hundred years ago: the oldest portions of their premises, of which the demolition has already been begun, were built in the latter years of last century. The greater part of the brewery site had been bought in May last by the London County Council for the erection thereon of dwellings for the working classes, in which accommodation will be found for some of those who will be dispossessed through the construction of the new street from High Holborn to the Strand, and the Council, we gather, will now relinquish their application to Parliament for compulsory powers to acquire land for that purpose within the limits covered by the sales. We are authoritatively informed that the sales of the brewery, 560 quarter plant and machinery, materials, ironwork, and fittings, beginning on October 31, were attended by buyers from all parts of the kingdom, and realised a total of 26,000*l*. The buildings, comprising offices, lodgings for the brewers and staff, arched cellars, stabling for 150 horses, and some deep wells, extended over thirty blocks, the entire area covering an aggregate of 156,500 ft. superficial, or rather more than three and a-half acres. The new road from Bloomsbury-square to Farringdon-road, which absorbed Liquorpond-street, was opened on August 3, 1878. Meux's Brewery was originally established, in or about 1790, in Liquorpond-street, formerly known as Lickapan-street—see Hatton's "New View of London," 1708.

Proposed Alterations in Bloomsbury.

IT is stated that the Board of Works for St. Giles-in-the-Fields have notified their approval of a scheme propounded by the Corporation of London in regard to their "John Carpenter" estate, lying in the north arm of the parish of St. Giles, between Tottenham Court-road and Gower-street. The property in question was laid out by George Dance, R.A., for the Corporation, in the interval 1790-1814, and most of the leases will shortly expire. It includes Alfred-place, with its two North and South crescents, parts of Chenies and Store-streets, and other adjacent blocks of houses. Under the scheme, we regret to say, it is proposed to pull down the two crescents, and to extend Alfred-place (which joins them) at both its ends by two new thoroughfares leading, by curves, into Tottenham Court-road, at points opposite Windmill and Tottenham streets respectively. The two crescents, with the wide street on the axis

between their centres, form a very nice little bit of effect in the way of laying out streets, carried out by an architect eminent in his day; this we shall now lose. There is (or was) a great deal of good architectural character of an unobtrusive kind among the squares and streets of Bloomsbury; and, between the Bedford Estate and other landowners, there seems to be a kind of conspiracy to destroy it all wholesale.

Proposed Church Crafts League.

UNDER this heading a letter appeared in the *Times* of Friday last week, signed by the Bishop of Rochester, Sir W. Richmond, and Mr. Holiday, announcing the formation of a new society to be called the "Church Crafts League," under the auspices of those who were discontented with the manner in which the Clergy and Artists' Association was carried on. It is stated in the letter that the Association "was well received by clergy, artists, and others interested in the promotion of true art in churches. But since its inception little progress had been made, and it was felt that the original rules left an opening for considerable mismanagement." In its further general statements the letter goes to confirm the correctness of our "Note" of December 23, in spite of Mr. Prior's vigorous protest printed in our issue of January 6, which receives full answer from two correspondents in the present number.

Fashionable Ignorance of Art.

THE "Recollections" of Sir Algernon West, for a long time Mr. Gladstone's Private Secretary, and who throughout his life was much in the world and knew all manner of persons, is an interesting book with many good anecdotes, but in one instance the author is amusing without being aware of it. Like many Londoners of the average type of English culture, he seems to have had an impression that Marochetti was a great sculptor, and refers to his big piece of *bravura* in Palace Yard as "the finest statue we have in London." It might be that, without counting for very much, but Sir Algernon West goes on to say that Marochetti's model for the Duke of Wellington's tomb was good, "but was unfortunately rejected in favour of the one which is now in St. Paul's" (!). This seems almost incredible at first sight. Here is a gentleman of evidently some ability, who was constantly moving in what is called "the best society," and who had evidently never heard, and had not the slightest idea, that Stevens's Wellington monument is one of the greatest works of art of the century, and refers to its selection in the competition as "unfortunate." The remark is a stigma on the artistic culture of London society generally, as well as on the writer of it. If Sir Algernon had been in the habit of hearing the Wellington monument referred to as a great work, in the political and social circles in which he moved, he would have had more *savoir faire* than to have "written himself down an ass" in that manner.

PUBLIC IMPROVEMENTS, ABERYSTWYTH.—Colonel Durnfield, R E., Local Government Board inspector, recently held an inquiry at Aberystwyth into an application of the Corporation to borrow 12,723*l.* for the extension of the promenade, and 3,300*l.* for the provision of workmen's dwelling-houses in the Smithfield. The Borough Surveyor, Mr. Rees Jones, stated that when the promenade was complete, it would have a sea front of one mile and a half. The number of houses to be erected in the Smithfield is nineteen.

THE SOCIETY OF PORTRAIT PAINTERS.

THE exhibition of this Society at the Grafton Gallery is perhaps one of the best they have given, though they would probably much improve the quality and value of their exhibitions if they did not attempt to fill the whole of the galleries, but were content with the octagon vestibule and the large room.

The existence of a Society specially devoted to portraits gives an excuse for a certain amount of what may be called experimental painting—suggestions as to special methods of treating a portrait, some of which are of interest, if they occasionally run into eccentricity. The octagon room affords an opportunity for reflection as to the different ends that a portrait painter may pursue. Mr. Watts, in his portrait of Mr. C. G. Montefiore (6) gives an example of the simple portrait—that is, the portrait which gives only the representation of the sitter, with no pictorial composition or accessories, but in which the likeness is somewhat refined away from realism into what the artist would like to make it, or what he thinks is the central ideal of his sitter; a system which produces fine paintings but somewhat doubtful portraits. The absolute contrast to this method may be seen on the opposite wall, in Mr. Llewellyn's portrait of Mr. R. J. Ashton (20), which is an example of the merely realistic "likeness"; not, it must be confessed, interesting as a picture, but probably, from the very careful manner in which it is executed, a very exact representation of the original. The question, as between two such examples of portrait painting (there are a good many intermediate stages between them) is this—do you want, in a portrait of a friend, the artist's ideal of how he might or ought to look at his best, and a colour treatment representing the artist's ideals in colour; or do you want a representation as like the original as possible? Both schemes are defensible. Probably the latter is of the more interest to the friends of the sitter, the former to those who do not know him and only look on the work in an abstract sense, as a picture. Millais, especially in his portraits of eminent men whose career was before the world, had the faculty of combining both objects; in his portraits of Gladstone and Shaftesbury he produced not only a striking likeness but a portrait symbolical of the career and character of each. Mr. Watts rather tends to sink the likeness in the symbolism; he makes use of a sitter not so much to make a portrait as to make a "Watts." If the sitter is content to be thus treated as the raw material from which to produce an example of the painter's art, others have no right to complain; but it is a question whether this is exactly portraiture in the direct sense of the word. Among other portraits in the same room Mr. Guthrie, in his portrait of Mr. W. R. Macdonell (11) obviously treats the portrait as an opportunity for the display of his own quality of a somewhat coarse and defiant vigour of style; Professor Lenbach, in his head of Dr. Döllinger (9), thinks the credit of the portrait-painter is shown in rendering the original as hideous and as unlike human flesh and blood as possible; while in the portrait of a lady (7) he sees the opportunity to produce a modern imitation of Romney. These two works taken together show that this painter has no principle whatever in treating portraits, except to produce something that will attract attention to himself in one way or another; quite the worst theory of portrait painting. A relief to these unattractive works is found in Sir L. Alma Tadema's charming family group of portraits (3); three ladies looking at picture on its easel, while the fourth figure, a man, is seen at one side as if showing the picture; a small and beautifully finished work, in which the hands may be said to be portraits as well as the heads, so carefully and minutely are they painted. Perhaps a still more charming work is the little picture by the same artist of a lady in evening dress (5), with all the surroundings in the room, including the bit of stained glass seen in the rear, treated so as to assist the whole effect without being obtrusive. We do not think, however, that either of these were painted for the occasion; the first mentioned one, indeed, strikes us as familiar already.

In Mr. Lavery's large full-length of Mrs. Hoare (8), the person seems rather sacrificed to the effect of the brilliant dress; the flesh-tones are dull and heavy; in short, this is an example of another type, which we may call the costume portrait, in which the object is to produce an effect with a rich dress and surroundings. As long as the figure herself (for this type is nearly always a lady's portrait) is the predominant interest, there is no objection to this, and very fine portraits have been produced in this method; but we do not think the balance is kept in this case. Among other pictures in the octagon room is Mr. Walton's "A Bacchante" (13) which hardly comes under the heading of a portrait, but is perhaps hung here to explain the artist's scheme of colour in his "Head of a Girl" (19), which does profess to be a portrait, but is somewhat unreal in appearance; the author has a fine sense of colour, but his treatment is better suited to the Bacchante than to the modern subject. It is a pity he could not lend a little of his colour to Mr. Blake Wirgman, whose portrait of Miss Sinclair (23) is very graceful in pose and expression but curiously cold and white in colour.

Among the very miscellaneous collection of works in the large room is one contribution from M. Carolus-Duran—a portrait of a little girl (48) which seems to have been suggested by Reynolds's characteristic child portraits; it has not the individuality of style, however, which Reynolds imparted to this class of portrait, nor is it in the French painter's best manner in regard to colour. Among the other portraits in this room which may be singled out as of special interest is Mr. Glazebrook's of Mrs. Mitchell-Chapman (46), a half-length facing the spectator, in a dark dress only brightened by one or two bits of pink bows, and the face in shadow from the large hat—so much in shadow as almost to suggest that there is a gauze veil over it, though we take it this is not the intention; there is a good deal of original charm about this work. Mr. T. B. Kennington astonishes us with a full-length portrait of a lady in a dress in which pink predominates, while a green curtain forms the background, a combination not harmonious to the eye; and Mr. Von Glehn exhibits a portrait of a man (58) painted in the modern superficial style with the face looking like a piece of parchment rather than flesh; a portrait somewhat vulgar in effect and impression. Mr. Shannon's "Mrs. Chaloner Dowdall" (67) leaning over the end of a sofa, is a pretty example of the *degagé* style of portrait. Mr. Lorimer's "The late Sir David Chalmers," which hangs next to it, was surely in the Royal Academy some years ago; we seem to remember seeing it in the large room there. This raises a question how many of the portraits at this exhibition are really new and painted for the occasion, and whether a good many of them are not merely old works sent in response to a secretarial "whip."

There are few works in the long gallery that one is tempted to dwell upon much, but we should mention one charming portrait of a little boy (71) by a French painter, M. Gabriel Nicolet, which both in colour and character is admirable, and should have been hung in a more prominent position.

The presence of a greater number than usual of military portraits, chiefly of officers now engaged in the South African War, as well as one of our respectable adversary General Joubert, which are not remarkable for artistic interest, seems to indicate that the exhibition is intended to appeal to the popular mind on other grounds than those of art pure and simple.

THE ARCHITECTURAL ASSOCIATION.

THE ordinary fortnightly meeting of the Architectural Association was held in the Meeting room of the Royal Institute of British Architects, at No. 9, Conduit-street, Regent-street, W., on Friday last week, Mr. G. H. Fellowes Prynne, President, in the chair. The minutes of the last meeting having been read and confirmed, the following gentlemen were elected members of the Association, viz., Messrs. L. W. Ensor, N. A. Leach, and F. E. Lloyd.

It was announced that the next meeting of the Discussion Section will be held on Friday, the 19th inst., when Mr. C. B. Bone will read a paper on "Granite as a Building Material in the Channel Islands."

The Chairman, in announcing that the second meeting of the Elementary Water-colour Class will be held on Friday, the 19th inst., said that it was a great pity that so few members had joined, and if any members now desired to do so there was still time, as only one meeting had been held, and there were five to follow.

Mr. Arthur Bolton then read the following paper, entitled

"*The Dome as the Basis of an Architectural System.*"

"The Dome is not only the grandest of architectural features, but may be regarded also, equally with the vault, as the basis of an architectural system. A tendency exists to regard the Dome more as an isolated feature, centralising in character, than as the expression of a principle of covering, capable, as the vault proved to be in the hands of the Gothic architects, of pervading the whole structure of the building to which it is applied. Such a proposition might, I think, be deduced from a survey of the application of the dome in the buildings of more than one epoch, and from examples developed on very varying lines of plan. The requisite clearness of idea, however, can best be maintained by restricting our survey to one epoch, the Renaissance in Italy, and by further selecting two types, which I think may be traced in the churches of that period. The considerations brought out, however, by the study of the examples given, are by no means intended to be confined solely to buildings of that epoch and character. If the idea of a definite principle in the use of the dome be granted, the further value of these examples will consist, not in the particular details characteristic of that period, but in the light thrown on the general problem of the structure, in an artistic sense, of such domical interiors. Similarly, the restriction of the illustrations to churches only is an accident rather than an essential, a great development of such buildings having taken place in Italy simultaneously with a revival of interest in the dome as an architectural feature.

The modern dome is an Italian creation, and the numberless examples to be found in that country present the series of changes and experiments that mark the introduction of a fresh element in architecture. With the spread of the Renaissance such studies were carried abroad, and two examples, here given from Spain, witness to the wide interest of the problem of the application of the dome at that epoch. There is an unfortunate paucity of examples in this country, but the work of Sir Christopher Wren shows the influence of the movement, and though his work exhibits a preference for vaulting and flat ceilings, still singularly interesting results were achieved by him in the application of the dome at St. Paul's, St. Stephen's, Walbrook, St. Mary-at-Hill, St. Mildred, and at two other destroyed churches of a later type.

The duration and wide extent of the Renaissance movement, its composite character and divergent tendencies, render selection imperatively necessary, and difficult as is the task of suggesting lines of development, still the attempt is worth making, because of the interest and value that may thus be found in what would otherwise seem to be merely isolated experiments. There is, moreover, no reason to suppose that the movement has exhausted itself, or that as the basis of modern European architecture, in a wide sense, it will yet be displaced for a long period. What has happened is that the special interest that was attached to the order system, derived or associated with Roman architecture, has lapsed, and that consequently lessons may be drawn from a study of the buildings of the Renaissance, independently of the customary architectural features and details of that period. In the fuller knowledge and interest of the present day in the work of earlier epochs, it would be a mistake to regard Renaissance methods of treatment, in matters of detail, as the only ones suitable and expressive for modern, and particularly church, architecture on a domical basis. Nor, on the other hand, is it wise to refuse any merit or worth to any examples, either of an early or late date, owing to a comprehensive prejudice regarding their details. What "building in a good Roman manner" meant to the Renaissance men is becoming mythical to us who have lost touch with a sentiment due, on the one hand, to a restricted knowledge of old classical architecture, and on the other, to the historical and literary associations connected with ancient Rome; while as regards the quarrel between the orthodox, and the rebel Rococo School, we are no longer concerned to take sides, but rather to appreciate whatever signs of progress we can detect, even beneath a mask of detail that may seem oftentimes sufficiently inappropriate.

Working, therefore, on such lines as those traced out above, we can proceed to select for study two types, to be roughly distinguished as—*I., The Domical Church,* and II., The Five-Dome plan.* The first of these types is the result of the application of the dome, as the system of covering, to a settled form of church plan that had been handed down from the Middle Ages. That the common type of church plan, which is the result, mainly, of the Gothic system of vaulting, modifying previous structures popularly described as basilicas, should be equally affected by a new phase, such as the introduction of the dome, is only logical. It is a fact that may be briefly illustrated by one point only—a matter of primary setting out—such, for instance, as that the basis of the Gothic plan having been a nave of oblong bays and an aisle of squares, with the dome a square compartment, became desirable throughout. Though the nave of St. Paul's shows us that some degree of compromise on this point is possible, still this condition is one of radical importance. If the test of style in a Gothic cathedral be, as has been suggested, that every part should be vaulted, so also in a domical building, the dome should be the chief covering agent. The first type, therefore, "The Domical Church," is one of peculiar interest as the study of the effect of the introduction of a new principle of covering to a settled type of plan, largely the outcome of a preceding system.

The second type, "The Five-Dome plan," exhibits the dome in its most characteristic development from the original simple sphere, covering a single apartment. In this form the chief dome is presented in a relation of contrast and proportion to its four satellites, while the originating idea of the cupola as expressive of space is preserved, according as the scale of the surroundings has been successfully calculated to enhance the main effect.

We shall find that the two types we have chosen to treat are often overlapping, for, obviously, a plan like that of *St. Salvatore*, Venice (Example No. IV., lithograph 1†), is formed by repeating the five-dome plan, in order to obtain the length of a church of the common type, while *S. Alessandro* (Example No. XVII., lithograph 2: see also view in sheet of "Domed Interiors") may be described as a compromise, being a five-dome plan with an eastward in place of the more usual westward extension. For the purpose of our classification, however, there is a sufficient distinction between the two types, as the five-dome plan is a geometrical form complete in itself, while the domical church is the outcome of the use of the dome as the covering principle for plans of the traditional type.

The subject of the leading domed churches of Europe has been so often, and so well treated, that we can assume familiarity on the part of our readers with the plans and treatment of the Pantheon, St. Sophia, St. Mark's, St. Peter's, St. Paul's, &c.; all the more, because in reality they are examples of another type, being mainly built as domes, in the sense in which the Pantheon at Rome is a dome—namely, a circular apartment whose effect is due to its spherical ceiling; while our object is to show the changes that result from the application of the dome, when used to produce a domed interior of a complex character, one in which the annexes contribute to, but are not sacrificed to, the special effect of a great dome.

In order, therefore, to deal with the subject in sufficient detail, we have set aside in addition to these great dome churches, the octagonal type also, which starting from Roman forms and the early baptisteries, passes through such phases as St. Vitale at Ravenna, and S.M. Angeli at Florence, &c., to the developed form of S.M. Salute at Venice, examples resulting in the main from the addition of an aisle outside the primary octagon.

Another type passed over is that of the simple Greek Cross, as S.M. Carceri at Prato (1485-91, Giuliano Sangallo), of which form numerous examples exist in Italy, as until the plan is enlarged to a square, by the angles being filled in and treated with minor domes, a line of development can hardly be said to have been started. In reality, the two forms, the Greek Cross, and the Five-Dome plan, are distinct types, with probably a separate, if related, origin.

The problems of vaulting, left unsolved by the Romans, found an outlet in that phase which we call the Gothic style, the essence of which as a vaulting system lay—firstly, in the device for roofing oblong bays by means of pointed arches, thus superseding the clumsy Roman methods of groins of eliptic and double curvature; and, secondly, in a special and continuous development of the rib as the feature of the vaulted covering. By Gothic analogy, therefore, that which seems to be necessary for the progress of a style is a certain emphasis of leading points, which will then pass imperceptibly through various phases, often returning in the end to the point of departure. Thus we see the rib running through a series of changes until, in the fan vault, it has sunk to a surface decoration, one of the points, in fact, from which it may be said to have started. Similarly, in a Domical System, we might expect that the problem of expanding the simple domed apartment of the Pantheon, on the lines of the complex type of church plan worked out during the Middle Ages, would lead to changes, both in the main characteristics of the dome itself, and also in the plan to which it was applied. Nave and aisles are crushed by the space of the dome pure and simple, and the problem took two shapes, one in which a great dome was the essential and the surrounding parts were merely related to it, and served to enhance its value, and the other in which the dome is modified to the existing plan and then becomes, as it were, only a new system of covering, possessing, as compared with the preceding, the effect of surfaces instead of lines, and of space instead of height or length. In such a process the loss might be great, the simple effect of a great sphere tending to disappear in the multiplication of parts, but the gain should be in the unity resulting from the universal use of the dome in all parts of the plan, and in a step taken towards the development of a complete scheme, as a possible basis for a new system. That the results of the first efforts were not a complete success does not mean that the problem was an impossible one, but only that the originators could not clear themselves at a bound from those Gothic traditions that explain the structural compromises of St. Peter's and St. Paul's. Half the interest of an enquiry into domical principles, and indeed into the architecture of the Renaissance as a whole, lies in the unsolved problems presented. Look at the internal treatment of St. Paul's. What a series of difficulties it admittedly reveals, but how little confidence do we feel that our age could have better solved the problems of its architecture!

Before proceeding to concentrate, therefore, our attention on the two types thus marked out—namely, "the Domical Church" and "the Five-Dome plan"—we must first consider in a general way the special qualities of the dome.

The essence of the dome internally considered in spaciousness, and the majesty and harmony of covering a plan with its own section is most fully realised in the Pantheon at Rome. This effect, however, is accompanied by a lowness of proportion which, after the great height of the mediæval work, could hardly appear other than trivial. Moreover, the bondage of the circle is felt, and an enlargement of the diameter produces little extra grandeur compared with the actual increase of size. The first efforts, therefore, in the use of the dome are marked by a great height, which, though lower than the previous Gothic proportion, was soon felt to be intolerable, and the progress of domical building, as it may be traced in Renaissance examples, is a record, with some exceptions, of a continued reduction in height of the interior. In working on such lines the Italian architects were often not hampered by external considerations, elevations being the exception, as their churches are often situated in the centre of blocks of buildings. Moreover, even when isolated, the practice of the Roman, and also we may add of the Italian Gothic, architects had accustomed them to a considerable indifference in the matter of external effect. It happens with us, possibly owing to the majestic grandeur of St. Paul's, that the dome has come to be thought of as a great means of obtaining external effect, but a people familiar with the Pantheon as their master-

* In our lithograph plate of this class of plans we have preferred to call them "The long plan with dome," as we think the expression "domical church" rather implies a church in which one great dome is the predominant feature.—ED.

† By "lithograph 1," we refer to the uppermost of the two plates of plans and sections in this issue; "lithograph 2" refers to the sheet below it. The plans printed as blocks with the text are referred to as being in "Fig. 1" or "Fig. 2." The names of all churches illustrated are given in the text in italics.—ED.

work, might well feel the influence of the dome in a different way. Hence, in this essay we can, for this and other reasons, discard external considerations, and treat the subject from the interior, as a matter of plan or section producing an internal effect, which however, in any genuine architecture, would never be out of due relation to its external appearance. Such considerations may be left as belonging to the future possibilities of domical architecture. From the point of view, therefore, of the interior we shall argue that height, a leading feature in the mediæval vaulted interior, is destructive of the effect of space, the special character of the ideal dome, and that the constant reduction in that proportion is directed toward satisfying a desire for spacious effect. The problem thus became that of ousting the Gothic influence as a step towards the formation of a new system, whose principle might be that all coverings are domical and not cross vaulted.

This tendency to absorb the dome as a roofing principle led to fundamental changes in its nature. Being brought into relation with the whole plan, it is transformed in size and character. Harmony of dome and nave is obtained by reducing both to one key, from which a complex plan arises, as the minor parts must be also covered on a domical system, if consistency of structure is to be obtained.

In a domical church the problem of adjusting nave and dome is complicated by the necessity of avoiding too great a contrast of height. For while in a dome pure and simple the whole of the surroundings are merely subordinated to a grand effect of space and height, the domical church by its length upsets the balance and destroys that special effect.

Given a long nave with one or two domes in its length, the resulting vista down the church presents serious gaps, due to their height, and to remedy this defect a complete change of character was brought about. The drum of the dome is first given up, then its section is lowered to a saucer shape, and finally it is amalgamated with its enclosing arches. This last process is based on the principle that every plane section of a sphere is circular, consequently the dome is no longer bounded by the enclosing square on plan, but these four arches are really sections through a dome of much greater diameter. We might say that the dome springs with the enclosing arches, and that the pendentives are abolished as a distinct architectural feature, being now, in fact, portions of the sphere itself. This particular process of domical treatment we propose to identify throughout as "the surface vault," being a term expressing something of its special effect. By this method a great reduction in height is secured, while the domical principle remains, and the effect is perhaps more characteristic than if, the pendentives being retained as a distinct feature, a segmental saucer be sprung from the crowns of the enclosing arches, which is the only other way of securing a similar result.

This absorbing of the dome as a system may be usefully connected in idea with that characteristic of Roman plans, wherein walls of immense thickness seem to have had dug out of them the minor features of their exedræ and recesses. We shall return to this point later on when dealing with St. Andrea at Mantua (Example No. I., plate 1), here we wish only to draw attention to the analogous way in which the timid openings in the square piers of a Byzantine church, such as St. Mark's at Venice, are transformed into the minor compartments of the five dome plan. In this there was a principle capable of expansion, for the dome is then carried on open piers related in covering to itself, like parts of a completely domical structure; as under the Gothic system, the cross vaulted bay of the aisle responds to the wider and loftier compartment of the nave. This may be said to be a departure of greater promise than that shown in the early form of dome church, as St. Andrea at Mantua (Example No. I., plate 1), where the plan is that of a dome supported on the barrel vaults of nave and transept, whose length is simply destructive of the main feature to which they are intended to belong. It was an advance in one way to place the Pantheon on to a vaulted hall of equal scale, but it was also spoiling both. It is a greater step to bring both into harmony, and this it was the main effort of the Renaissance architects to accomplish.

The problem, then, of the domical church is this relation of space and length, and it has been partially solved by a reduction in height. This was a gradual process owing to Gothic influences, and to a desire, now and again predominating, to obtain a commanding external effect. As regards the interior even, it may be conceded that the dome, reduced to a surface vault, drumless and pendentiveless, loses something of its character, but the gain lies in the binding together of the parts, so that the great arches are of the dome, and the dome of the whole church, while by the introduction of minor domed compartments scale is obtained, and the general system begins to approach the harmony of the Gothic scheme. It is not pretended that the forms described were new, as they may be found in Roman and Byzantine buildings; but that does not detract from the value of the work of the Renaissance architects, who were attempting to fuse them into a new system. Moreover, Renaissance art, being essentially individual, examples cannot be followed out in that sequence, which we may find in mediæval architecture; but though some type may appear in advance, or be carried out with a knowledge, and a certainty, beyond that of a work of almost the same date, still a general tendency can be traced with sufficient clearness, and may be followed up with advantage.

Many of the forms and features described may be traced, often crudely, in the studies of the first architects of St. Peter's, as displayed in Baron de Geymuller's book on that subject, thus Antonio Sangallo's "Study for a Nave" shows a treatment of domes on the surface vault plan which is highly interesting. One may, however, suggest a caution not to look at such sketches too much in the light of subsequent knowledge, or we may be attributing to their authors a more advanced skill than their work would have displayed, had it been executed.

Type I.—The Domical Church.

We enter then upon the consideration of our first type, that of churches more or less completely designed on a domical system, after having cleared the ground by the foregoing preliminary consideration of some of the elements of domical architecture.

Our first example, the church of *St. Andrea* at Mantua (Example No. I., lithograph 1), begun by Alberti, in 1472, is remarkable in the history of art as the first modern church with a dome. The reason, however, for including it in this place is, that its system of enormous walls, within which chapels are as it were dug out, brings it into relation with the plan of carrying domes on pierced square masses, which has been already discussed. For, if we imagine the tinted squares placed the square of the nave apart, and then opened up, we have the plan of *St. Salvatore* Church. (Example No. IV., lithograph 1.) In St. Andrea the side chapels are arched over below the entablature, which carries a continuous barrel vault, and the tinted squares, having only small doors of access, form no part of the internal effect. They are thus waste space in fact, while preventing any circulation outside the nave. These compartments, moreover, must be as high as the chapels themselves between, unless a minor gallery were arranged over them, somewhat as in the Jesuit church at Rome. It is not too much to assert of this example that the plan is eminently one awaiting expansion, and that it possesses a high value as an originating work. St. Andrea is a church, moreover, which must be seen for its effect to be fully realised, otherwise it is hard to understand why it is one of the noblest of all the Renaissance churches, possessing some magic of simplicity and proportion, which affect the spectator with a dignity and grandeur that might not be appreciated, from a mere inspection of the design on paper. In its enormous solidity of construction, it is a direct outcome of the revived interest in the grandiose ruins of Rome.

The Carmine Church at Florence (Example No. II., lithograph 1), although the part illustrated—the nave—is late in date, being rebuilt in 1771, and not important from the point of view of domical design, is given here as an instance of a similar but reduced treatment of thick walls and a single nave. The supports in this case are smaller, and the chapels are made perhaps more useful in the general effect by their half-dome heads carrying up the eye to the main vault.

The æsthetic difficulty of the single span church is the tendency of the walls to lean outwards in appearance, and the partiality of the Gothic builders for arcades has been ascribed to a perception on their part of the correcting influence of curving lines. Consequently the treatment in this instance is a good example of what may be done in such cases, while the alternation of solid and void, in good proportion, is the probable explanation of the appearance of great size which this nave possesses.

On the same plate the small diagram of *St. Giovanni Battista*, Pesaro (1540, G. & B. Genga) (Example No. III., lithograph 1), shows the other type of internal buttressing. The well-known church of the Redentore, Venice (1576, Palladio) has practically this plan, but masked by the use of the revived orders, the side chapels becoming the deep arches of a Roman arcade, from the Coliseum.

This digression on the simpler problem of the one-span church has its use in that our first type, "the domical church," is a derivative of the large hall, without however reaching a stage of greater development until, by the formation of aisles, the problem becomes more complex. It is the call to adapt the dome and the traditional church plan that is responsible for the more interesting attempts that followed. There are in Italy, and elsewhere, a number of Renaissance interiors of the normal Latin cross plan without aisles, which most often are replaced by side chapel recesses. Such examples, though possessing a dome at the crossing, are not domical churches proper, but from them there is a development, perhaps best illustrated in Rome itself, in which these side chapels are enlarged to squares, and carried up for separate domical treatment, as in the Church of the St. Apostoli (1702-24, Fontana). Remarkable effects of lighting can be obtained, where these compartments are top-lit, but the general unity of the interior is broken up by such semi-isolated features.

The great height of the bays of the side aisles of the nave of St. Peter's (1606-12, Carlo Maderna) shows an approach to this idea.

The plan of St. Carlo in the Corso (1612: Onorio and Martino Lunghi) is as though such a series of chapels were thrown together, to form a wide aisle in front of the usual chapel recesses, the passage way being carried right round the semi-circle of the apse. Each domed compartment is separated by bays, the width of the arcade piers, and in working round the apse the cupolas become oval in plan, while the separating bays are slightly radiating. As is well known, the application of the dome solves in the easiest way some of the problems of chevet vaulting. It is worth while to mention this example, when considering the subject of domical churches, because the wide aisle has been a subject of experiment in modern work, on account of certain advantages in seating accommodation, and it is conceivable that the domical idea could be well utilised in such a type of interior. The aisle question will be found to exclude large batches of domical examples of more than one period and style.

The fourth example, *St. Salvatore*, Venice, (Example No. IV., lithograph 1) commenced on a scheme by G. Sparento, approved in 1506, was carried on and completed by Pietro and Tullio Lombardo in 1534. It is the largest and most important of a series of studies in the application of the dome, the outcome of the influence of St. Mark's, and probably of other smaller churches in Venice of that period and character. The centre of St. Mark's was seen to constitute a complete conception in itself, and the expansion and development of the Byzantine model was followed out by the Renaissance architects in Venice. The square pier masses which in St. Mark's, and other examples of the style, carry the domes, are here cut away to mere legs, leaving a good aisle on either side of the nave, but the treatment in detail is such as to retain their character as supporting piers. Internally they are domed either with surface vaults, as in St. Giovanni Grisostomo (1497-1504 by Moro Lombardo), or have cupolas sprung from a string over the arches, as in St. Salvatore. These piers are the key to the whole interior, as a definite relation should exist between them and the main dome, both in scale of plan, and in height of section. This is a consideration further dealt with in the second part dealing with the five dome plan. St. Salvatore, though a small church, is remarkable for structural harmony and elegance, due, probably, to the almost exclusive use of the dome as the covering agent.

PLATE 8

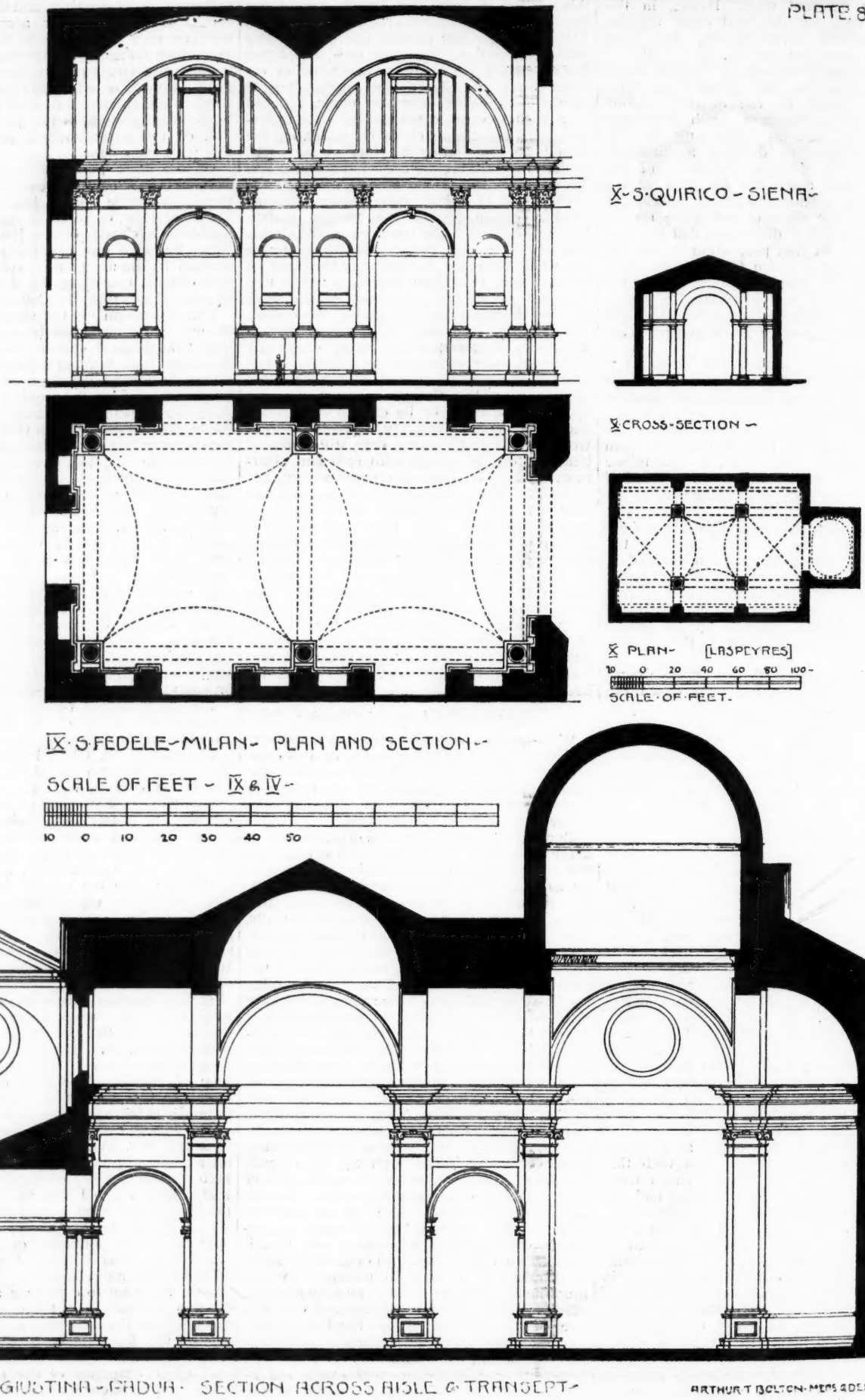
X- S·QUIRICO - SIENA-
X CROSS-SECTION -
X PLAN- [LASPEYRES]
10 0 20 40 60 80 100
SCALE·OF·FEET.
IX· S·FEDELE-MILAN- PLAN AND SECTION-
SCALE OF FEET - IX & IV -
10 0 10 20 30 40 50
IV - S·GIUSTINA - PADUA · SECTION ACROSS AISLE & TRANSEPT -
ARTHUR T BOLTON· MEM S DEL

Fig. 1.—Plans and Sections of Domed Churches. Type I. (See also lithograph plates.)

This church is supposed to have exerted considerable influence on our next example, *St. Giustina* at Padua (Example No. V., lithograph 1, and fig. 1; see also plate of "domed interiors") the model for which, by Alessandro Leopardi, was accepted in 1521.* On his death in the latter half of 1522 or beginning of '23 the work was continued, but it seems likely that changes, at any rate in the detail, were made. Andrea Morone, engineer, who was appointed in 1532, is responsible for the upper parts.

* Cf. Osvaldo Paoletti.

There is a heavy and clumsy character about the work, especially in the covering, which it is difficult to associate with the architect of the Colleoni pedestal and the mast standards of the Piazza at Venice, also works by Leopardi.

It would seem as if the scheme of St. Giustina had been biassed by the designs for St. Peter's, founded in 1506; as though it were a compromise between the development proceeding in Venice, and the more grandiose ideas current in Rome.

The defect of the Paduan church is that it length is obtained by the crude device of repeating the main dome three times down the nave, of the same diameter, but very much lower in height. The nave domes are divided from each other only by a single pier with narrow arch band. This pier is buttressed by an arcade across the aisle, and has the effect of a mere partition wall, while the central dome, though of equal span, has a compound pier and ample width of barrel vault to rest upon. This is an inadmissable distribution of the supports from an artistic point of view, the nave

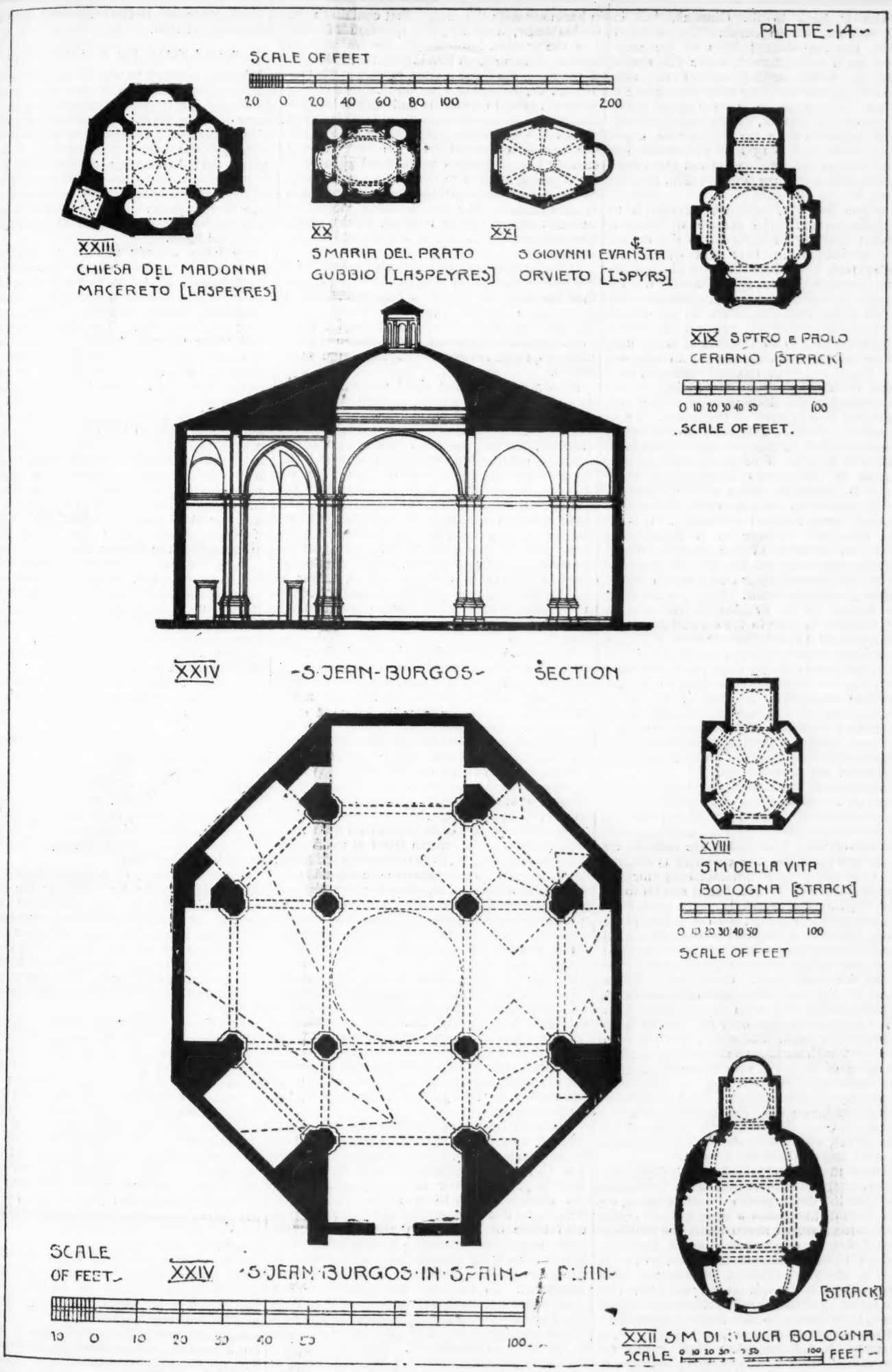

Fig. 2.—Plans and Sections of Domed Churches. Type II. (See also lithograph plates.)

appearing too light in constructive effect, while the crossing seems clumsy. There is, in fact, a want of unity in the plan which may be broken into two portions.

The five dome treatment of the crossing resembles that of *St. Maria Campagna* (Example No. XVI thograph 2) in that the four minor domes are shown outside, the resulting height producing internally a most well-like effect. This church is notable in that it possesses some degree of external character. The west façade is still in the rough, but the nave outside is treated in what may have been the style of the Roman Thermæ, and being in simple brickwork is not ineffective, presenting perhaps an idea of what those great Roman buildings may have looked like, supposing that they were left unplastered.

The Church of the Benedictines, *St. Nicola*, Catania (Example No. VI., lithograph 1), a plan of which is given on plate (3) is on

very similar lines to St. Giustina, but is better worked out in detail. The division between the two domed bays of the nave is here much strengthened, while the single instead of double setting out of the side chapels is more in harmony with the scheme of the plan. This example is on a great scale, about 350 ft. by 210 ft., producing a striking internal effect with some perspective capabilities. Built 1558 to 1578 by P. Valériano of Catania, it was restored on the old lines after an earthquake, a century later, by Gian Battista Contini.

Example No. VII. (sections, lithograph 1; plan, lithograph 2), the *Duomo* at *Ferrara*, is an old building modernised to the design of F. Mazzarelli in 1637 and carried on from 1711-28. It displays several features which illustrate the study upon which we are engaged. At once more complex and interesting than the other examples, built on an oblong site, lit almost exclusively from a clearstory, this building affords an instance of what may be done with a town church on an ordinary plot. There are three internal transepts, each marked by a dome, the intervening blocks being treated on the Gothic plan of oblong bays in the nave, and squares in the aisles. There is, however, a minor difference in the setting out, for a kind of lateral perspective has been obtained in the plan of the piers, such as may be seen in Bramante's architectural background to Raphael's fresco of the School of Athens,* but which has not, so far as the author is aware, been realised elsewhere. It is an effect especially suitable in a Renaissance church, on account of the stability that it suggests, preventing too many cross views, as well as that slender pillar effect which distinguishes a Gothic interior. That the last point is a danger to be avoided in Renaissance churches may be seen in the earliest examples, as St. Agostino at Rome, the cathedral at Pienza, &c. In such early instances, the Gothic plan is merely clothed in classic detail, as in the piers, which become four pilasters back to back, of inordinate proportion, in spite of the use of pedestals, owing to the attempt to reach up to the cross-vaulting at the usual level of a mediæval interior. Such an effort is not aided by the small rise of a round arch, as compared with that of the pointed form.

Returning to the consideration of the plan before us, an explanation may be due to the reader who is at home in vaulting problems, and may be wondering how those oblong nave bays are ceiled. The groins are not ellipses, nor do they twist, but the covering is circular barrel vaulting with intersections for the windows, the wall arches being run on to the main vault at the crown level, or nearly so; the half groins, however, are not in one plane, as the halves of a diagonal rib would be, the junction being concealed by the decoration. These wall arches, moreover, are sprung high up off the vault itself. Undoubtedly this is rather a trick, but, when one remembers the difficulties of roofing such oblongs with round arch vaulting, one can only be amused at the ingenuity displayed. The aisles, it will be seen, are domed with surface vaults, adding much to the sense of apparent stability in this church. The lighting of the building is remarkable, proceeding almost entirely from the intervening blocks on their three sides, through a clearstory over the aisle, the domes being windowless, with a very good effect as regards the light and shade of the interior.

Unlike many examples, this of Ferrara has the advantage of conforming to the *doctrinaire* rule, that the dome marks a resting-place, for here each distinguishes a transept, and is also a point from which seven altars are visible at once, being an effect sometimes arrived at in modern Roman Catholic churches, as in the crypt of the Sacré Cœur at Montmartre. The lines of sight, laid down on the plan, show that this result is obtained by an attention to cross views, not common in Renaissance interiors.

The question, however, of the impolicy of using domes, at other than points of rest, is really one of vista, it being assumed to be unpleasing to look down a series of domes; that is to say, it is the structural question of the dome section, for while domes of the pendentive and drum types are apt, by rising high above the enclosing arches, to make awkward gaps in the line of the covering, saucer domes and surface vaults are not so open to objection, being lower in section and more in harmony with the arches that contain them. Undoubtedly, however, the question of vista is of the greatest importance. For instance, in this very example, on looking down the length of the nave, the three domes, or rather the two beyond us, occurring after the cross vaulting between, tend to leave the end arches of each block without apparent support. This effect occurs also in Gothic cathedrals whose crossing carries a lantern. In the latter case a remedy has sometimes been found in vaulting the crossing level with choir and nave, which, of course, at once extinguishes the problem. In this instance the use of saucer domes, or surface vaults, for these transept domes, would have removed the effect of the gaps to a large degree.

Considerations of vista are also a reason for the level ridges of an English Gothic vault, in that the effect of length is best produced by providing a line for the eye to travel along, and that of the vault crown is one of those most naturally followed. In wooden roofed interiors, ridge rib and purlins effect the same object.

Ribs are not at first sight a promising idea in connexion with domes, though there are cases, where the use of strongly marked ribs, as in St. Maria di Gradi, Viterbo (1740, Salvio Niccolo), carried up from the angles of an irregular octagon, or other form on which the dome rests (see also plan of *San Giovanni Battista*, lithograph 1), still leaves something of the special dome effect, such as might not be entirely lost if a system of wide bands down the centre were used, leaving circles to occupy the spaces at the sides.* The introduction, however, of ribs in domes, while producing often a ceiling of powerful effect, seems to destroy those special qualities of the sphere as a covering, which count for so much in the attractiveness of the dome as an architectural feature.

From the point of view of a domical church there is a certain imperfection in combining, as in the Duomo at Ferrara, domes with cross vaults, one being a surface and the other a line treatment. St. Paul's presents a clever compromise in this respect, as in the nave the oblong bays are covered by saucer domes which rest on the cross arches at the ends, while on the sides they are supported by the groins of an interpenetrated cylinder. The defect, however, follows that the sides appear insufficiently supported by the thin line of the groin, as compared with the ends carried on the strong cross arches. The wreath band at the base of the saucer dome, while exaggerating the point, seems required to emphasise the cupola form. A glance at the plan, however, of our example shows that the two cross-vaulted bays of the intervening blocks between the transepts could very well be treated as one composition, either domed with a saucer or covered with a barrel vault. Of this there is the instance, given on the same plate, of the *Badia di St. Flora* at Arezzo (Example No. VIII., lithograph 2) [1550 (?) Vasari] in which the treatment below the vault is as a Palladian bay of two free columns and a central arched opening. A small oval dome across the aisle gives emphasis to a side altar. The tendency to setting out in square bays, in domical work, is directly manifested in the greater harmony of the Badia scheme.

We shall conclude this part of our essay, dealing with Type I., the Domical Church, by a reference to *St. Fedele*, at *Milan* (Example No. IX., fig. 1) (1569-79, Tibaldi Pellegrini). This is an instance of the application of the surface vault to a single span nave, bringing this example into comparison with those of St. Andrea and the Carmine, with which we started. It illustrates also how, in the Later Renaissance, a treatment of columns as orders on stricter Roman lines was attempted. In this case the columns of the main order are used as vaulting shafts, as in the Thermæ, though with a closer adherence to rule, than probably distinguished the works of the Romans themselves. We may consider this example as the model of the Madeleine, at Paris, though the covering in that case is by pendentives and top-lit domes. Aisles in this type can be obtained by bringing out the order free from the side wall, and covering the passage by a barrel vault from column to column, as in *St. Quirico*, Siena (Example No. X., fig. 1), illustrated on the same sheet. A good abutment is thus obtained where the side walls are thin.

Second Type.—The Five-Dome Plan.

We now proceed to take up our second type, differing from that which we have been considering in this important respect, that the five-dome plan constitutes an isolated and self-contained structure, and retains rather more of the original dome effect, possessing as it does a central and dominating, cupola-covered area. It is, perhaps, the most satisfactory development of the simple domed apartment of the type of the Pantheon, as it is free from the complications that arise with attempts upon an octagonal basis.

We have already alluded to the relation between the examples of our second type and the Byzantine model, as in St. Mark's, Venice, and also to the process of opening out the square supporting masses as minor domed compartment of the plan. The barrel vaults that bind these squares together agree well in idea with the main dome which they carry, being, in fact, only arches of an ampler width, insuring a greater sense of stability. The system as a whole tends to lower the interior, as the pier compartments, as hollowed out, must not be too high internally, while the existence of much space above would call for an upper story, also domed, such as, indeed, might well exist, in relation to a system of internal galleries of a structural character. In *St. Salvatore* (lithograph 1) the space above is disposed of as a panelled attic, the lines of which range round the whole interior. In applying the classic features to this type of plan, the legs of the piers became naturally the main pilasters, enclosing a minor order carrying the small arches of the internal dome, this treatment agreeing well with the ideas of Bramante and Palladio. In certain examples these minor domes have drums, and show outside as turrets as in S.M. Campagna Piacenza, and St. Giustina, Padua; but in St. Salvatore, Venice, the drum is omitted, the dome springing from a string just above the heads of the small arches, which are united by pendentives.

By the use of the surface vault, as already explained, a still further reduction of height can be effected. The same course can be adopted with the central dome, as in *St. Rosa*, Viterbo (Example No. XII., lithograph 2), by which means the whole interior may be brought to a unity, and spaciousness of effect, such as the first efforts could not attain, owing to their excessive proportions.

There are cases, of course, where the five-dome plan might be used for the opposite quality, should a frankly tower-like result be desired, for if sufficient attitude were given to the minor domes, the central feature could be carried to an otherwise unattainable elevation, producing a strong impression of height, but at the expense of, what are generally considered to be, the special characteristics of the dome.

The Fortezze Church at Viterbo, dedicated to *St. Francesco e Paolo* (Example No. XI., lithograph 2), is just outside the walls of the town. It was built for one of the Farnesi, who were great patrons of the architect Vignola; he was, in fact, building Caprarola for them between 1555-9 in the same neighbourhood, so that the attribution of this work also to him is not unreasonable. The exterior is unfinished and the interior rather rough, though not wanting in dignity. This example is interesting in our enquiry, because in the same town is St. Rosa, just mentioned, built in 1848, of almost the same dimensions but of an entirely different internal effect. The two are drawn side by side to the same scale.

The quality of space tends to disappear when much height is given, and not only are the minor domes of St. Rosa proportionately less in height, but the surface vault principle being applied to the main dome, a great reduction in the total height is obtained on a similar plan of nearly equal dimensions. The greater effect of spaciousness obtained is very much more than is accounted for by the actual difference in size. Some part of this is due to the greater attention bestowed upon the minor domes, and to the attempt that has been made to bring them into closer relation with the central area. The modifications introduced into the plans of the main piers are in this direction, and also in that of providing a better seating for the start of the domes. It will be observed that the minor domes might have been treated as surface vaults, reducing their

* Usually considered to represent Bramante's ideas for a St. Peter's, with a nave on the basis of a Latin cross plan.

* French Gothic vaults, where treated with English ridge ribs, produce a somewhat wavy effect owing to the rise and fall of the ridge, although this is not so noticeable as might be expected.

height, with a probable gain in spaciousness of effect to the whole interior. The aim in a church of this type must be to get good cross views, and a perfect relation between the central and minor domes, in which respect the relative bulk of the four great piers is a matter of primary importance. An example on the same plate, the church of *St. Maria del Letto*, at Pistoia (Example No. XIII., lithograph 2) (about 1509, Ventura Vitoni), shows that a tempting solution of this side of the problem was not untried. It seems easy to replace the piers by four single columns, giving a practically unencumbered square interior, while carrying on them the vaults and domes above, as we find done in Byzantine examples, or in La Martorana at Palermo, in which last pointed arches are used. Renaissance examples also are to be found, in which single columns are used, and one in which a group of four half-columns fused together forms the pier. The drawback to this single column plan, however, lies in its excessive simplification, by which it loses interest, a single glance reveals the whole interior, and also seems to stamp the upper part as somewhat of a fraud, so much architectural scenery above with so little apparent support below. Whereas the pier system, at any rate, has more reserve and mystery, while the unity and relation of parts can be equally well preserved, and above all it has that air of stability which constitutes so large an element in genuine architectural effect.

When the S.M. Letto type is extended on all sides, still using columns, the plan of St. Stephen's, Walbrook, is approached, as the formation of a central octagon, by the omission of the four middle columns becomes necessary, to secure the relative increase of importance to the dome. We have, in fact, a hall of columns to which a cupola is applied in order to secure a free central area. The type is essentially a compromise owing to the tendency in the spectator's mind to restore the omitted columns, an impression probably arising in part from the difference of scale between the small bays of the colonnade and the wide central area.

It is interesting to remember that Palladio's favourite form of vestibule is a hall about thirty feet square, having four columns about five feet out from the angles. In his designs the central area thus formed is usually cross-vaulted, leaving flat ceilings for the angle squares, but with a domical treatment the five dome plan is obtained, and would be equally palatial in effect. This is recorded in passing as an illustration of the domestic application of the type.

El Sagrario, Granada, a Spanish instance, 1705-59 (Example No. XIV., lithograph 2) approximates in scale of plan to St. Francesco (No. XI.) and St. Rosa (No. XII.), but exhibits a wide variation of internal section. In this instance height has been striven for, and attained by making the interior practically in two stories, the minor domes being lifted above the main order. The chief peculiarity, however, is that the minor cupolas are placed at the cardinal points of the main dome, the angles being cross vaulted. The plan obtains considerable extension by a series of deep recesses in the external walls, and by adding to this a relative smallness of features, the impression of a large church is produced. In comparison with St. Rosa, it is interesting to observe that the central squares of both are of the same dimensions, all the increase of size in the Spanish example being given to the surrounding areas. The surface vault, however, of St. Rosa conveys an idea of a dome of much greater diameter than that in El Sagrario, where the greater height also detracts from the importance of the central feature. If the system of the Spanish example were carried to its logical development, the effect of a square hall would result, the lofty piers becoming incidents in the interior, while the minor domes, acquiring the importance of the central feature, would seem to be parts of one comprehensive domical covering. The arches in three tiers in the side sections, rising from the wall recesses to those which carry the vaulting of the angles, and on up to the arches of the minor domes, constitute the best feature of the scheme. The many breaks in the detail are characteristic of the Spanish use of the orders.

Our next example (No. XV., lithograph 2), the church of *Madonna della Stecatta* at Parma, built by Giov. Franc. Zaccagni from 1521-39, is like the Invalides at Paris and churches of that type, in that the angles of the plan are not brought in as parts of the general effect. This is especially the case in this instance, as the only openings are small doorways, thus reducing the plan internally to a simple Greek cross, like the church of St. Maria Carceri at Prato, a type which it is not our purpose to discuss.

An interesting point about this example is the greater attention bestowed upon the exterior, and the fact that the cupola drum is surrounded by an arcade, in place of the more usual colonnade, while the curve of the interior and exterior dome are almost the same.

In another example (No. XVI., lithograph 2) the church of *S.M. Campagna*, Piacenza (1522-28), attributed somewhat doubtfully to Bramante, the angle domes are carried up as turrets outside, with the usual loss of internal effect. The exterior is an interesting piece of brickwork, rigidly following the lines of the interior design. The five dome plan is here extended by barrel vaulted bays on all sides, giving length and a transept effect; while the diamond, on which these plans naturally shape themselves, falls within the walls of the church. Except for a gain in cross views and accommodation, the architectural effect is not much improved, though, of course, greater height can be indulged in with success.

There is a diagonal line to be applied in section, as well as in plan, when determining the height of these interiors. The most suitable point to consider is that at which the circle of the dome lantern, or the apex of the cupola, is to be cut off by the cornice of the springing, or by the crown point of the enclosing arches. The same consideration applies also to the minor cupolas. The next important station point is that in the extreme angles of the plan, from which the relative bulk of the great piers can best be appreciated. The plan of these piers is, therefore, a point of great interest, for, obviously, on that depends the extent of the cross view of the interior as a whole, as well as the appearance of adequate support for the superstructure.

The first improvement on the simple early form of a square recessed pier is to cant the angles towards the smaller domes, as is done slightly in St. Francesco (detail of pier, lithograph 2) and rather more in St. Rosa (No. XII.). The piers of S.M. Ghiara at Reggio (1597, Alesso Balbi) have very large cants to these minor features. When the domes are surface vaults, the cant is like the start of the cupola, and where a pendentive is used, it acquires greater importance beginning in that way, than when it commences from nothing in the internal angle of the pier.

It will be noticed that a large cant to the main dome characterises the Spanish example (lithograph 2), which also shows the doubling of the arch bands of the minor domes, as occurs in late instances.

A form of pier of a different character is obtained from the column type (No. XIII., plate 9), when minor arches are introduced under the entablature, so that the order becomes one quarter engaged. There was an example by Sansovino, St. Geminiano, Venice, 1556 (unfortunately destroyed), of about the same scale of plan. The column on the angle of the minor squares is an effective feature, though, with any close adherence to the order system, certain detail difficulties would have to be faced, which probably accounts for the rarity of this type. The great development of pier in S. Alessandro, Milan (lithograph 2), obscuring the angle domes of the plan, exhibits a tendency backwards to the plan of St. Peter's at Rome, as it now is, with its isolated angles and absence of cross views.

We have not in this essay to deal with questions of architectural detail, but we may say, in passing, that these piers belong to that late phase of the Renaissance already alluded to, when an attempt was made in using the orders to give them a separate character. This idea was expressed in various ways, but the plan of inserting a complete column, and forming a recess behind it, as in the example before us, was a favourite expedient.

The complications of the order system are possibly more felt in the second type than in the first, as the same need for the vertical lines of pilaster and column is not experienced in the five-dome plan as in the Domical Church.

S. Alessandro at Milan, already referred to (1589-1602, L. Binaghi), may be described as belonging in part to both of the selected types. It exhibits a skilful extension of the five-dome plan eastwards instead of westwards, as is the more common. By this means on entering we realise at once the full effect of the dome, unweakened by any preliminary extent of nave, while the second impression of length beyond is pleasing and the manner is good, as the second dome repeats the first but in saucer form, wisely attempting no second effect of height, and the vista then closes in with the natural termination of an apse.

Without entering on a third division of the subject, we will glance for a moment at the later stages of the domical architecture of the Renaissance in Italy. We have alluded above to a late form, in which irregular octagons (see plan S. Giov. Pesaro, lithograph 1) are domed with strong ribs from the angles, as somewhat converting the dome into a vault in effect, though still leaving something of its special character. There is considerable boldness of effect in some of the later examples of this type, as S.M. di Gradi. Viterbo (1740, Salvio Niccolo).

S.M. Vita, Bologna (Example No. XVIII., fig. 2) (1687-1787, G. Borganzoni), is another instance, but with the plan enclosing an oval shape, such as in the last period became a marked feature.

Such oval churches, as *S. Pietro e Paolo*, Ceriano (Example XIX., fig. 2) (1670-1679), and *S.Maria Prato*, Gubbio (Example No. XX., fig. 2) are interesting in the present day, because experiments have been tried quite recently in oval interiors, and the geometrical and structural aspects of the problem can be observed in these old examples, bad and unsuitable as their details may appear. A special study might well be given to this type on that account.

Of the hexagon variety (Example No. XXI., on the same plate, *S. Giovanni Evangelista*, Orvieto, is an example (fig. 2); while the curious late attempts to, as it were, square up within an oval circumference a central circle or square, with annexes reaching towards the boundaries of the enclosing curve, are illustrated in Example No. XXII., the Church of the *Madonna di S. Luca* at Bologna (1731, C. Dotti).

Example No. XXIII., the *Chiesa del Madonna* at Macereto, by a pupil of Bramante, is an earlier form, in which the central square and annexes are comprised in an octagon.

Our last example (Example No. XXIV., fig. 2), *St. Jean* at Burgos, is more closely connected with the five-dome plan, though the octagonal boundary has reduced the minor domes to triangular spaces of vaulting. The interior, less octagonal in effect than appears on paper, is spacious, and seen at a glance. The piers are tal and slender, almost to excess, while the dome is somewhat small, and tends to lowness of effect, owing to the proportionate increase of the surrounding areas. The use of the pointed arch to solve the difficulties of the triangular vaulting is a singular fact.

In conclusion, we have endeavoured to treat the subject of Domical Architecture as a question of structure in an artistic sense, and of proportion both of plan and section, independent of what is called style. While details are decaying, form in structure may still be progressing, and the interest of the later examples is often due to an advance in the general handling of the problem. This progress may be lost sight of if we allow ourselves to be blinded by prejudice induced by the detail employed, more particularly in late examples of the Renaissance.

An instance of the independence of detail of these problems may be seen in the new church of the Sacré Cœur at Montmartre, which, though Romanesque in detail, belongs to our second type. Amongst other points this example shows how an increased height can be obtained in the minor domes of the five-dome plan, by the simple expedient of forming openings with Welsh groins in the barrel vaults enclosing the dome, so that the whole of the space within the hollow piers is opened up. By this means the effect of an otherwise excessive height in the minor domes is obviated, and their area is included in that of the main structure. If, however, this process is carried too far the square hall effect is produced. Somewhat analogous is the treatment of the angles of support to the minor cupola vaults of the Panthéon, Paris (see plate "Domed Interiors"), though here carried out with an excessive lightness of pier, and in a somewhat disconnected manner, due mainly to the entablature of the order below.

The Roman Catholic Cathedral, in progress at Westminster is an instance of the use of domes on a large scale, the nave consisting of three domed bays of 60 ft. diameter. The side arches

are here divided into two bays, as in St. Antonio at Padua, while structural galleries are obtained by arches on columns as in St. Mark's. Many other developments are possible, and will occur in future examples of domical architecture.

An irresistible tendency to development will be displayed in architecture when a start has been made on the lines of a possible system. The first experiments are often reckoned as failures, but the future is more indulgent than the present, and a consideration of their importance as links, oftentimes gives a credit to buildings, that might be denied to them solely on their artistic merit."

The following is the list of examples referred to in the paper, with the dates and the names of the architects. Those in italics are from the author's own surveys and are all drawn to uniform scale. The small diagrams in addition, illustrations from Laspeyres, "Die Kirchen der Renaissance in Mittel-Italien," Strack, "Central und Kuppel Kirchen der Renaissance in Italien," and Hittorff & Zanth, "Architecture Moderne en Sicile," have their o vn scales attached :—

Ex. No.	Name.	Place.	Date.	Architect.	Drawings.	Photo.
I.	St. Andrea	Mantua.	1472	L. Alberti	Plan.	—
II.	S.M. Carmine	Florence.	1771-82	G. Mannaioni	Plan, section.	—
III.	S. Giovanni Battista ..	Pesaro.	1540	Design of G. Genga, carried out by B. Genga ..	Laspeyres, plan, sec.	—
IV.	S. Salvatore	Venice.	1506-34	G. Sparento; compl. by P. & T. Lombardo ..	Plan, two sections.	1
V.	S. Giustina	Padua.	1521-34	Alessandro Leopardi; Andrea Morone	Plan, two sections.	2
VI.	S. Nicola (Benedictines)	Catania.	1558-78	P. Valeriano..	Hittorf & Zanth, plan.	—
VII.	Duomo	Ferrara.	1637	Design F. Mazzarelli; continued 1711-28	Plan, three sections.	—
VIII.	Badia di S. Flora	Arezzo.	1550?	Vasari	Laspeyres, plan, sec.	—
IX.	S. Fedele	Milan.	1569-79	Tibaldi Pellegrini	Plan, section.	—
X.	S. Quirico	Siena.	—	—	Laspeyres, plan, sec.	—
XI.	S. Francesco e Paolo ..	Viterbo.	1560?	Vignola	Plan, section.	—
XII.	S. Rosa	Viterbo.	1848	—	,, ,,	—
XIII.	S.M. Grazie o Letto ..	Pistoia.	1509-35	Ventura Vitoni	,, ,,	1
XIV.	El Sagrario	Granada.	1705-59	—	,, ,,	—
XV.	Mad. della Steccata ..	Parma.	1521-39	G. F. Zaccagni	,, ,,	1
XVI.	S.M. Campagna	Piacenza.	1522-28	Bramante?	,, ,,	1
XVII.	S. Alessandro	Milan.	1589-1602	L. Binaghi	,, ,,	1
XVIII.	S.M. della Vita	Bologna.	1687-1787	G. Borganzoni	Strach, plan.	—
XIX.	S. Pietro e Paolo	Ceriano.	1670-9	—	,, ,,	—
XX.	S.M. del Prato	Gubbio.	—	—	Laspeyres, plan.	—
XXI.	S. Giovanni Evangelista..	Orvieto.	—	—	,, ,,	—
XXII.	Mad. di San Luca ..	Bologna.	1731	C. Dotti	Strach, plan.	—
XXIII.	Chiesa del Madonna ..	Macereto.	—	Pupil of Bramante? ..	Laspeyres, plan.	—
X XIV.	S. Jean	Burgos.	—	—	Plan and section.	—

Schedule of Churches Illustrated.

The Chairman said that they knew, when they saw Mr. Bolton's name on their syllabus, that the paper would be a thoughtful one, and they had not been mistaken. The paper would give them food for thought, and for this, and the illustrations which Mr. Bolton had shown, the thanks of the meeting were specially due.

Mr. R. Phené Spiers, in proposing a vote of thanks to Mr. Bolton, said he quite agreed with the Chairman that the paper had given them something to think about, but for that reason, and because there were so many points raised in the paper, it would be difficult, or impossible, to discuss the paper without carefully reading and considering it. The paper might very well have been divided into two parts, each being dealt with on separate evenings. It was thirty years since he (the speaker) visited Italy, and it was difficult for him to recollect some of the buildings which Mr. Bolton had so recently seen. He did not quite agree with the lecturer as to the headings which had been given to the two parts of the paper, for he did not call type 1 a domical church. The fact that over a particular crossing—the crossing of the transept and nave—there happened to be a dome, did not constitute a domical church. The nearest approach to a domical church in the illustrations which Mr. Bolton had shown was that of S. Fedèle, Milan, which was in many ways a remarkable building, and represented another type of vaulting. He did not agree with Mr. Bolton's idea that he had done away with the pendentives. The pendentives were really the chief constructional features of the dome, and the fact that in some instances the upper portions of the dome and the pendentives carrying them happened to be part of the same sphere in no way lessened their importance. In the drawing made by Mr. Bolton on the black board, he had by accident omitted the indication of the arch line, which showed that the pendentive commenced on the line of springing of the dome. Nor did he (Mr. Spiers) quite agree as to what Mr. Bolton called the five-dome plan, for there were very few of that type. St. Marks was a five-dome plan ; so was in a contra direction. He was extremely obliged to Mr. Bolton for his very interesting paper, but before discussing it at greater length he desired to devote further consideration to it. The illustrations which Mr. Bolton had brought before them were an excellent series devoted to one subject.

Mr. H. H. Statham, in seconding the vote of thanks, said he had listened with very great pleasure to an interesting and admirable paper ; but, like Mr. Spiers, he felt it would be unprofitable to attempt to discuss the paper without studying it.

Mr. C. H. Brodie said that one could not help thinking, in looking at some of the illustrations which Mr. Bolton had brought forward, what a splendid church Wren might have designed had he had iron and concrete to work with.

Mr. W. H. Seth-Smith having briefly supported the vote of thanks,

The Chairman said that the paper would be of great value to them when printed, especially if accompanied by the illustrations. The subject was of great interest, and they must all agree with Mr. Spiers that, as regards domical treatment, St. Sophia was the acme of beauty. As to Mr. Brodie's remarks about Wren and concrete and steel, he was very glad indeed that Wren made use of the materials he did. The dome of St. Paul's was perfect in proportion. In his opinion the plan of St. Vitale, Ravenna, was one of the most suggestive for modern church work. One could not help wondering why the dome was not more taken up by Gothic men and Gothic artists. It was a marvel that no Gothic architect had done so thoroughly, especially as there had been examples extant from the earliest times.

The vote of thanks was then put to the meeting and carried very heartily.

Mr. Bolton, in reply, said that he was hoping to arrange later on for the publication of the paper in pamphlet form, together with the plans and illustrations, at a nominal figure. His interest in the subject was excited in this way : He first went to Italy on an Association Saint-Front de Perigeuex. He felt that plan No. 10 had a very fine effect (Mr. Bolton: Yes, but the detail is abominable). What he looked upon as domical started from St. Sophia, Constantinople. There was no doubt that as a student who had worked for some time in Paris, his thoughts were influenced by the École des Beaux Arts, and he was afraid that, in visiting Italy after studying in Paris, he had been rather disappointed with the Italian domes. The French school had certainly developed a domical system to a much greater extent than anything which could be seen in the Italian churches ; as, for instance, in the church of Montmartre, and the Church of St. Augustin, in the Boulevard Malesherbes. The dome was one feature, and not merely an accident of covering over particular spaces. There was a dome which was very little known, and which was based on a different system of construction, and that was the dome at Valence. The dome was on a tomb outside the north side of the church, and the courses of masonry of the vault, instead of being horizontal, were vertical. It was a section of a sphere, but all the joints ran tour, when he noticed that there seemed to be a relation between the churches of St. Salvatore and St. Mark's at Venice, and St. Giustina at Padua ; then some years afterwards he visited Sicily and was struck at finding the same idea in St. Nicola at Catania. Subsequently two churches at Viterbo near Rome, so alike in size, but so dissimilar in effect, attracted his attention. After that it became his habit, when he saw a church with five domes (*pace* Mr. Spiers), to make a study of it. Some one would perhaps say, What was the use of these studies in modern practice? Therefore he had brought before them an illustration of a small work he had carried out, which showed how, in the case of a staircase, such knowledge had been of some service to him. As to Mr. Spiers' remarks, he (the speaker) had expressly set aside from consideration domes like St. Sophia ; he knew the great importance of that monument, but what he meant by domical churches was not that kind of thing at all, but a church in which the principle of the covering was a dome. He ventured to think that the Italian architects had a difficult problem to deal with ; the clergy were used to the old Gothic plan, and just as in our St. Paul's one saw a mediæval church with a dome applied to it (for that is one of the characteristics of St. Paul's) the problem in Italy had been to retain something of the old church plan, and at the same time to make use of the dome. In following out this idea they had realised that one great big dome would not do at all ; the big dome was all very well when there was one great space to cover. Directly aisles were introduced the problem commenced, and thus was developed a plan such as they found in St. Salvatore, Venice, and, to his mind, a church like that with several domes in it was a very interesting study. It was a very nice thing to have a church like St. Sophia to design, but he did not think that any of them would have any such chance, as a great dome would not be built simply to be looked at. On the other hand, they might be able on a small scale to work out a scheme with more domes than one. He agreed with the Chairman's remarks as to Wren and the use of steel and concrete. As to the Church of St. Augustin in the Boulevard Malesherbes, Paris, it might be an interesting study outside, but they could hardly accept the interior as a fine church.

The chairman announced that the next meeting will be held on the 26th inst., when Mr. W. R. Lethaby will read a short paper on "Cast Iron."

The meeting then terminated.

Illustrations.

MONUMENT TO THE LATE M. ALPHAND, PARIS.

THE monument to the late M. Alphand, for many years director of public works in Paris, has been erected by public subscription in the Avenue du Bois de Boulogne. The sculptural portion is the work of the great sculptor M. Dalou, the pedestal and architectural accessories having been designed by M. Formigé. M. Dalou has represented Alphand "in his habit as he lived," holding in his hand the low hat which he usually wore, and as if bending down to give directions to the four figures grouped beneath, who are intended to personify Engineering, Architecture, Painting, and Sculpture, as concerned in the decoration of Paris. M. Dalou has, however, given to these figures the portrait heads of four representative men—viz.: M. Huet, Inspecteur-Général des Ponts et Chaussées ; M. Bouvard, the well-known architect ; M. Roll, the painter ; and for the sculptor M. Dalou has introduced his own likeness. There could hardly have been a greater compliment paid to the administrative genius of Alphand than to represent these eminent men as combining to carry out his general scheme.

The bas-relief on the exedra in the rear represents various classes of workmen engaged in carrying out work in planting, digging, &c. ; indicating the part taken by Alphand in the formation of new squares and gardens in Paris. The whole is an admirable example of an artistic monument.

Not much is known in this country about M. Alphand, but he played a very important part in the improvement of Paris for very many years. Without being himself an artist, he had

a very clear perception of what could be done with a site, and a remarkable energy and resource in organising and carrying out a large scheme. Paris owed him a monument, and has fulfilled the obligation in a manner which has added another ornament to that beautiful city.

SOME DOMED INTERIORS.

THESE interiors are from photographs used by Mr. Bolton as illustrations to his paper on "The Dome" at the Architectural Association. Three of them, those of S. Giustina, S. Alessandro, and the Panthéon, are referred to in the paper in illustration of special points. The whole paper is printed in the present issue.

PLANS AND SECTIONS OF DOMED CHURCHES.

THESE two sheets contain most of the diagrams exhibited at the Architectural Association last week in illustration of Mr. Bolton's paper referred to above; the remainder are given in two pages of cuts in the text accompanying the paper.

The plans have been purposely arranged regardless of their consecutive numbering, in order to group them into two classes indicated in the title. Unfortunately, whether from difficulties of space or from a mistake on the part of the lithographers, the plan of the Duomo at Ferrara, which belongs to "Type I," has been placed on the page dedicated to "Type II"; but otherwise the grouping indicated in the title is carried out.

The plans are all specially referred to and commented on in Mr. Bolton's paper.

THE SURVEYORS' INSTITUTION:

FOREST MANAGEMENT.

AN ordinary general meeting of this Institution was held on Monday evening last at No. 12, Great George-street, S.W., the President, Mr. T. M. Rickman, occupying the chair.

The minutes of the previous meeting having been read and confirmed, and some donations to the library having been announced,

Mr. John Nisbet, a Colonial Fellow, read a paper entitled "Forest management, with suggestions for the economic treatment of woodlands in the British Isles." At various times in past history Britain had, he said, experienced more or less acutely the want of timber for special constructive purposes. This was notably the case during the great period of naval warfare about a century ago; but improvements in communication by land and water had since then enabled the British Isles to obtain from foreign sources, and from our great colonies and dependencies, the vast quantities of timber now annually required. Those, however, who gave attention to statistics concerning the existing market for timber, the sources of supply, the annual increment in growth, and the present excessive demands for the supply of actual requirements, could not fail to be impressed with the serious position into which this country had drifted with regard to satisfying her necessitous demands for timber in the near future. The requirements in timber of the more commercial portions of the world — Europe and North America — had now become excessive, though not abnormal. They were strictly normal as a result of the vast industrial energy displayed, and of the adaptation of wood, both to general constructive industries and to special new branches, such as the use of wood-pulp and cellulose. But they were excessive, in so far that in many countries the sources of supply were now failing to yield in annual increase a volume of timber equal to what was being harvested. In other words, to utilise existing markets the forest capital of timber-producing countries was being encroached on in a manner that must soon lead to a much decreased out-turn. Apart from imported hard woods, such as teak timber from India for shipbuilding, Jarrah for wood pavement, and the like, the great bulk of the timber used for constructive purposes in Britain was coniferous. It consisted mainly of pines and firs, which were annually imported to the extent of 16,000,000*l.* a year out of total imports of forest produce varying from 20 to 22½ million of pounds sterling per annum. In considering the sources from which these existing requirements were supplied, the questions that naturally suggested themselves were: (1) Whence are these supplies drawn? and (2) Can these sources of supply be relied on for the future? The great sources of supply of coniferous timber to Britain were, and for many years had been, the countries forming the seaboard of the Baltic and the north-eastern corner of the North American Continent. These must form in the future, as they had in the past and do now, the great natural storehouses whence the supply of coniferous timber must be obtained, unless and until extensive new woodlands that may be formed in the British Isles could reach marketable dimensions. Unfortunately, however, these great sources of supply were now being operated upon by economic conditions differing from those which had hitherto obtained. In past times there was a competition of various countries to secure the great British market for their surplus supplies of timber. But now other countries were competing with Britain for possession of the timber required in ever-increasing annual quantities. Hence, in place of vast quantities of timber having to find a remunerative market, there was competition, which must gradually become keener and keener, among various countries to obtain for their own industrial requirements the surplus timber which other more thinly populated, but thickly wooded, countries would place upon the market for export. Our two great competitors in this matter, as in other industrial and commercial affairs, were notably Germany and the United States of America. Both France and Austria required more timber than even their own large forests were at present supplying them with. But Germany was our great competitor for the timber exported from Russia, Sweden, and Norway; while the United States, unable to supply their vast demands from their still extensive forests, must look more and more to the Canadian forests to eke out the diminishing supplies of home-grown timber and to supply all the fresh demands incessantly arising. The pressure which these economic forces were bound to exert in pushing up the price of coniferous timber had hardly yet been felt; but it was a factor which would make itself felt more and more, until steps of some sort were taken by Great Britain to secure adequate supplies of British timber, colonial or home-grown. For Britain was menaced by a coming scarcity of timber; and anything like the low rates which had previously obtained, and were now still obtaining, could hardly prevail for many years longer. Canada might be considered the greatest producer of coniferous timber in the world. If its splendid forest wealth were being properly conserved and economically treated—which was unfortunately not yet the case, although public opinion in the Dominion was gradually becoming educated to the importance of this—it could be made to yield *in perpetuo* large supplies of timber both to Britain and to the United States. Even supposing the whole of the Baltic supplies of timber to be attracted to Continental markets in place of coming for the most part to Britain, the mother country could still satisfy all her requirements as to timber for building from the great Canadian colony if the Imperial preferential treatment, about which so much was spasmodically heard from time to time, were duly cultivated so as to yield its promising economic harvest.

The position of the British timber market was therefore very much the same as that relating to the supply of food-stuffs. We did not produce of home-growth more than a mere fraction of the timber consumed in works of construction. The stocks held were not large, and building operations would soon be at a complete standstill if free communication on our ocean highways were interrupted for any length of time. Even allowing for the greatly enhanced use of metal and of other substitutes for constructive purposes, timber was a necessity. Actual circumstances being carefully considered, without prejudice, it seemed clear (1) that under existing circumstances adequate supplies of timber could only be obtained from foreign or colonial sources so long as Britain retained command of the seas, and (2) that, owing to the shrinkage in the world's coniferous forests, combined with the growing demands and the enhanced competition of all the great commercial countries (and particularly of Germany and the United States) for increased supplies, prices for this kind of timber must soon rise and would go on steadily increasing in the very near future. Unless and until this statement were approved, no great general improvement in forest management could be expected in Britain. If, however, they felt able to accept this forecast as a reasonable and probable one, then two practical questions immediately suggested themselves, namely: (1) Are the conditions at present obtaining on large landed estates in Britain such as will enable their owners to reap the financial advantages that the anticipated rise in prices would indicate as available? and (2) If not, what can be done to improve their economic condition?

With regard to the first question, the great majority of the wooded estates were managed upon principles in which economic considerations as to the production of timber were subordinated to other matters, and especially to sport. Most of the crops were badly stocked. If artificial, they had usually been planted at too wide distances; while both natural and artificial woods had generally been thinned to an extent permitting, and even encouraging, the growth of branches at the expense of length and cleanness of the stem. Crooked hardwoods and flowered timber for furniture could easily be grown in the hedgerows and in park lands and pastures; but long, clean stems, with a good, straight fibre free from branch knots, could only be grown in the close canopy of much denser woods than were to be found on most British estates. Mistakes, too, had often been made in the selection of trees when forming new plantations. Then, too, large numbers of timber trees in copse-woods were rendered almost useless by neglect. Not being felled when mature, they gradually deteriorated in value. Thus they became unprofitable in themselves, and occupied soil which should be bearing a vigorous crop of younger wood.

In this matter the State seemed, perhaps, most to blame for neglecting the national interests. The British Government had not as yet—like nearly every other civilised Government, including that of their own dependency, India—established any national school of Forestry. Nor had they done what might be reasonably expected of them to provide suitable instruction in economic forestry at the great universities and technical colleges, where most of those receive part of their education who later on fulfil duties in connexion with the ownership and the management of landed estates. And Government were not likely to remedy existing shortcomings save under popular pressure. But the landowners themselves were hardly free from the charge of neglecting their own interests; for with them it mainly rested to recognise certain strong disadvantages under which the growth of timber in Britain laboured, and to press various reforms upon the attention of the House of Commons, such as State instruction in forestry, the economic utilisation of the Crown forest lands, and the freedom of lands devoted to the growth of timber crops from some of the virtual restrictions now placed upon them.

The author then dealt with the question, What can be done to improve the economic condition of British woodlands? After pointing out what was being done in various educational centres in the country in the direction of forestry instruction, he said that the time had perhaps come when there was a fair opening for professional men, trained in forestry, to dedicate themselves to this branch of rural economy and to practise as specialists, whose services would be available for advising as to the formation of new plantations, and for reporting on forests and drawing up *working plans* recommending improved methods of treatment. In medicine, in law, and in other professions there were specialists to whom general practitioners took their cases for special advice; and he did not see why this should not also be quite feasible as to special professional advice with regard to the management of the wooded portions of landed estates in different parts of the British Isles. A commencement had already been made in this direction in different parts of England and Scotland, both by the Department of Woods and Forests and by private landowners; but the movement had not as yet become anything like general with regard to the wooded portions of large estates. The manner in which a working plan might be expected to effect improvements would extend on the one hand to making such recommendations as to the treatment of the existing crops, or the formation of fresh crops, as would lead to the soil being utilised to the fullest extent practicable, and, on the other hand, to the allocation of the

thinnings and falls of timber and of coppice in such a manner that the object in view of the proprietor might be met as fully as was feasible, and that the largest returns capable of being obtained from the given soil and situation might be continuously harvested in the shape of a regular yield sustained annually. As an appendix to the paper, the author submitted an extract from a working plan recently drawn up by him for the Right Honourable the Earl of Selborne's woods in Hampshire. "The Selborne woods consist partly of old copses and partly of coniferous plantations of recent formation. In the copsewoods the standard trees have not in the past been selected with a view to anything like regularity either as regards age or distribution over the area; while the coppices are not only incompletely stocked in many places, but are also filled with kinds of wood of less value than might be grown on the given soil and situation. For woods of this class the best rotation is usually about twenty-five to thirty years—*i.e.*, about $\frac{1}{30}$th to $\frac{1}{25}$th of the total area (according to productivity) forms the annual fall; but for specific reasons a rotation of only twenty years has here been adopted, so that about $\frac{1}{20}$th of the area is harvested annually. In order, however, to effect as rapidly as possible certain improvements both in the standard trees and in the coppice, a provisional rotation of ten years is first of all adopted, so that about one-tenth of the area will be felled during each of the years 1899-1908, and only after that will the normal rotation of twenty years become applicable. With regard to the conifer plantations, the evils of wide planting have not yet been fully remedied. Hence thinning must for some years be restricted to the removal of diseased and suppressed poles, for any forcible extraction of revenue from these plantations at present would only be deliberately interfering with the future market value of a crop grown economically in normal density of canopy." Proceeding, the author said:—If landowners and estate agents decided that the future prospects of British forestry were such as to warrant some outlay in the preparation of working plans and in the improvement of the wooded portions of estates, then it might probably be the case that large additions would soon be made to the existing area under woodland. At present, of a total area of land and water exceeding 77 million acres in the United Kingdom, over 47 million acres were under crops and grass, leaving nearly 30 millions of acres as hill pasture, moorland forest, waste land, and woodlands. Now, if there were going to be solid inducements offered by the home timber-market of the near future, it would probably be in the interests of the landed proprietors to bring portions of this vast uncropped tract under forest with economical management. And it would certainly be to the advantage of the country in general if this took place, for the increased labour thus requisite would improve rural conditions. It would help keep the men on the land in place of flocking to the large towns, and it would keep money at home which now goes abroad for coniferous timber that might easily be grown in Britain. Considering the long periods of time which ordinarily elapse before newly-formed woodlands yield any tangible return from the capital invested in them, and considering the great fall in the value of and the returns from agricultural utilisation of land, Government might reasonably be asked to make advances of money at a low rate of interest (say, the rate yielded by Consols) to landowners desirous of planting portions of their estates to be managed as economic forests. And it would merely be an extension of the same principle if advances were also specially made to enable landowners to have working plans drawn up for their existing woodlands and to carry out the recommendations of such plans framed by specialists licensed, if necessary, by the Board of Agriculture.

A vote of thanks to Mr. Nisbet was proposed by Mr. C. Bidwell and seconded by Mr. Robt. Anderson, and the discussion was continued by Professor Fisher, Mr. Geo. Cadell, and Mr. E. W. Hudson. Mr. C. Bidwell, on behalf of Mr. Daniel Watney, moved the adjournment of the discussion until the 29th inst.

INSTITUTE OF SANITARY ENGINEERS (INCORPORATED).—At a meeting of the election committee, held on the 10th inst., the following were elected, viz.:—Fellow: J. Preece James, Tenby. Member: K. D. Subramani Aiyar, Madras. Associates: R. W. Watts, London, and J. Lennard, Brentford.

METROPOLITAN ASYLUMS BOARD.

THE ordinary fortnightly meeting of the Managers of the Metropolitan Asylum District was held on Saturday at the County Hall, Spring Gardens, Sir Edwin H. Galsworthy, the Chairman, presiding.

Local Government Board.—Letters were read from the Local Government Board authorising the erection of a laundry, a rain-water reservoir, &c., at the North-Eastern Hospital, Tottenham, at a cost of 14,801*l.*; asking for a detailed estimate of the cost of the proposed additional buildings in connection with East Cliff House, Margate; and asking for further information as to the estimated cost of the proposed laundry works at the Leavesden Asylum.

Park Hospital.—The Works Committee reported upon the judgment of Mr. Edward Pollock, official referee, in the action brought against the managers by Messrs. Leslie & Co., the contractors for this hospital. The decision having gone against the managers, the committee recommended that there should be an appeal to a Divisional Court, and, if necessary, to the Court of Appeal. The plaintiffs' claim was for compensation for the delays of specialists employed to execute certain works in connexion with the hospital, on the ground that the specialists in question were nominated by the managers and that the contractors had no option but to employ them. The official referee upheld this claim, although the contract included payment for all such works, and the plaintiffs had included in the tender as profit a sum equivalent in most cases to 10 per cent. on the amounts which they paid to the specialists. Another part of the claim was for 3,100*l.* bonus, founded on the resolution of the managers of October 24, 1896, by which the plaintiffs were to be paid a bonus of that amount if they completed the hospital to the satisfaction of the architect, Mr. Edwin T. Hall, by July 7, 1897, or, failing that, a bonus of 50*l.* for every day between the completion and September 7, 1897. The bonus was to be independent of and without prejudice to the contract, and "absolutely conditional on the completion by the dates named, without any allowances in respect of weather, strikes, or any other cause whatsoever. The architect's certificate as to the date of completion and handing over to be absolutely final and binding for the purposes of this offer."

The main point in the action, said the Committee, was that the specialists were agents of the contractors and not of the Board. The official referee, however, gave judgment for bonus of an amount to be ascertained, and held that the words, "any other cause whatever," in the bonus resolution did not include the defaults of the specialists. If this decision were upheld, there would be no advantage to the Board in the employment of one general contractor, embracing the payment to him of a profit on the work of specialists. The only object of that profit was that the contractor should undertake the responsibility for the whole work. The official referee found, as a fact, that the plaintiffs had no control over the specialists, and that the Board and not the contractors were responsible for the default of the specialists. The Committee had always taken the view that while the architect must control the design and technical instructions as to specialists' work, the general supervision was in the contractor's hands, and he was responsible for the whole. If the decision were left unchallenged, it would have very far-reaching consequences. Mr. Brown, Chairman of the Committee, said that considering the large interests involved, he thought the managers would be unanimous in deciding to appeal. The recommendation of the Committee was carried.

Tooting Bec Asylum.—The Works Committee reported that since the plans for this asylum were adopted, two years ago, their experience with regard to the nature and extent of the laundry accommodation required in a hospital or infirmary for imbeciles had convinced them that changes might be made in the laundry plans which would admit of greater simplicity of construction and facility of supervision. They therefore submitted amended plans for the laundry by Messrs. A. & C. Harston, similar to the amended plans recently adopted for Joyce Green Hospital. The cost of the laundry would be reduced by about 500*l.* Mr. Brown, Chairman of the Committee, said it was unusual to alter the plans after the contract was signed, but the Committee had come to the conclusion that great improvements could be made in the design of steam laundries, and already laundries of the improved type had been sanctioned for two other institutions. The Committee had taken steps to prevent the contractor from going on with this work until the managers had decided the question. The plans were approved.

Joyce Green Hospital.—In reply to a question, the Chairman of the Works Committee stated that the plans and specifications of this proposed hospital had been approved, and were now in the hands of the quantity surveyors. The Committee expected in a few weeks to be ready to invite tenders.

ARCHITECTURAL SOCIETIES.

BRISTOL SOCIETY OF ARCHITECTS.—The usual monthly meeting of this Society was held at the Fine Arts Academy on the 8th inst. The chair was taken by the President, Mr. W. L. Bernard, and Mr. Beresford Pite read a paper on "Architecture in Palestine: Ancient and Modern." The lecturer first dealt with building conditions in the East, giving full particulars of the materials to be obtained, and the difficulties of transport and the absence of timber and joinery work. The price of building in Jerusalem was then gone into, and the curious method of charging by counting the number of the stones in the wall and other methods peculiar to the East. Plans were shown on the screen of the Greek Hospital, the Russian, the French, and the Jewish Hospital, erected at the expense of Lord Rothschild. A large number of interesting photographs of ancient buildings in Jerusalem were shown by means of the lantern, and the lecturer pointed out the works of the Romans, the Mohammedans, as also the mediæval Gothic work erected in the time of the Crusades. The leading points of interest in the Holy City were shown. Mr. G. H. Oatley proposed a hearty vote of thanks to the lecturer, and this was seconded by the Hon. Secretary (Mr. H. Dare Bryan). Other speakers were Mr. J. A. Slater and Dr. Bertram Rogers.

LEEDS AND YORKSHIRE ARCHITECTURAL SOCIETY.—At a meeting of this Society, held on the 8th inst., Professor Goodman gave a lecture on "Steel Construction in Buildings." During the course of it he stated that a steel structure was less dangerous in case of fire than a stone structure in which steel was incidentally used, for in the first case the building expanded altogether, and there was nothing forced out of place. Professor Goodman thought an allowance for 15 lbs. wind pressure was quite safe enough in designing buildings, although the text-books advised 40 lbs. The London County Council insisted upon the engineer for the Tower Bridge allowing for a wind pressure of 56 lbs. to the square foot, and from tests made since erection it had been ascertained the pressure had never exceeded 5 lbs. per square foot.—*Yorkshire Post.*

COMPETITIONS.

ROYAL INFIRMARY RECONSTRUCTION, GLASGOW.—A meeting of the Executive Committee of the subscribers to the Queen's Diamond Jubilee Fund and Glasgow Royal Infirmary Reconstruction was held in the City Chambers, Glasgow, on the 12th inst. The minutes of the previous meeting were read and approved. They stated that the executive had received from the sub-committee two alternative block plans, prepared by the Infirmary managers, showing how the site may be utilised in accordance with the approved modern requirements of a first-class hospital, but as being illustrative and suggestive only, and as not intended to tie down the architects to them; that the sub-committee had also submitted terms and conditions for the competition to be entered on for the plans and elevations of the new buildings, which were approved; and that they had been instructed to complete the remit to them by submitting the names of architects—to such number as they might consider desirable—whom they would recommend to be invited to enter into the competition. At the meeting on the 12th inst., the minutes of the sub-committee were submitted, recommending twelve architects to be invited to compete for the plans, and on the suggestion of a member another name was added to the list. The minutes, with this addition, were unanimously adopted. The following are the architects selected for

the competition:—John Baird and James Thomson, J. J. Burnet, H. E. Clifford, Campbell Douglas and Morrison, William Leiper, James Miller, all of Glasgow; R. Rowand Anderson, LL.D., Hippolyte J. Blanc, Sydney Mitchell, and Wilson, all of Edinburgh; and Edwin T. Hall, London; John W. Simpson, London; Alfred Waterhouse, R.A., London; Young and Hall, London. A neutral architect of standing is to be appointed to assist the committee in deciding on the most meritorious plans; and an honorarium of £100 is to be paid to each of the unsuccessful competitors. The City Chamberlain was requested to communicate to the architects named an invitation to take part in the competition.

ARCHÆOLOGICAL SOCIETIES.

SOCIETY OF ANTIQUARIES OF SCOTLAND.—The usual monthly meeting of this Society was held in their library at the Museum, Queen-street, Edinburgh, on the 8th inst., the Hon. John Abercromby, vice-president, in the chair. In the first paper, Mr. F. R. Coles, assistant-keeper of the Museum, gave a report on stone circles in Kincardineshire and Aberdeenshire, with measured plans and drawings, obtained under the Gunning Fellowship. The map of the district visited from Banchory as a centre showed nine stone circles south and nine north of the Dee, all of which were carefully surveyed and described in detail. Of these eighteen stone circles, eleven were of the type peculiar to the north-eastern district of Scotland, having the space between two of the pillar-stones filled by a huge block placed on edge, or on its longest side on the line between the pillars. Some of these recumbent stones are of great size, the largest met with in the present survey being 17 ft. 4 in. in length, by 4 ft. 6 in. in breadth, and 2 ft. 3 in. in thickness. After describing each of the circles separately, and showing ground-plans and drawings of their most characteristic features, he gave a brief statement of the results of the survey, which showed the existence of three different types of circles in the district surveyed—first, the type with upright pillar-stones only; second, the type comprising the circle of pillar-stones, with one of more stone settings, more or less concentric, in the interior; and, third, the type characterised by the most striking feature of the recumbent stone between two of the pillars, which last is the type of the district. The position in the circle of the recumbent stone is not strictly constant, varying from a point south-east of the centre to south and south-west. In one case it stands well within the circumference; in most other cases, where it has not been disturbed, it is in line with the other pillars. The pillar-stones usually increase in height towards the recumbent stone, the four stones nearest to it being usually the largest and most prominent. So far as there is direct evidence of their purpose, in every case in which systematic excavation has revealed a purpose, they have been found to be burial-places of the Bronze Age, and any other purpose has yet to be proved. But a much more extended survey and investigation is requisite before final conclusions on these and other interesting questions relating to stone circles can be reached. In the second paper, Mr. A. G. Reid, F.S.A. Scot., gave a notice of a document in his possession bearing the superscription of King Charles II., and dated at Breda, May 22, 1650. The third paper, by Mr. David Macritchie, F.S.A. Scot., gave a description of an earth-house at Pitcur, in Forfarshire, which is larger and more varied in plan than most of its kind in Scotland. It consists of a curved subterranean gallery, 190 ft. in length, with a subsidiary gallery curving in the reverse direction, of 60 ft. in length. The width throughout varies from about 5 ft. to as much as 10 ft.; the roof is mostly gone, but remains over about 50 ft. of one end of the gallery, which is between 5 ft. and 6 ft. in height. The objects found in it, like those from a good many others, show that it was in occupation subsequent to the Roman invasion of Britain. In the last paper, Mr. Thomas Wallace, F.S.A. Scot., Inverness, described some cists with unburnt burials found on the farm of Moraytown, in the parish of Dalcross. —*Scotsman.*

ELECTRIC LIGHT AND POWER STATION, WIGAN.—The memorial stone of the new power station of the Wigan Electrical Works, in Bradford-place, Chapel-lane, was laid on the 4th inst. Mr. H. Collings Bishop is the architect and engineer; and Mr. W Winnard, Wigan, the contractor.

BUILDING TRADES' GIFT TO THE NATION:

HOMES FOR DISCHARGED SOLDIERS.

MR. EDWIN O. SACHS, as Chairman of the Executive of the Building Trades' Gift to the Nation, writing from No. 1, Waterloo-place, Pall Mall, wishes to state, in answer to the numerous inquiries from all parts of the country with which the Executive have not yet been able to deal individually, that printed details are now being prepared, giving the exact quantities of materials, fittings, &c., required for the Discharged Soldiers' Homes. These details will be issued on Friday, and will enable intending donors to determine exactly the direction their contributions should take.

In the meantime, we have much pleasure in announcing here that among the first donors who have generously contributed to the entire set of the six homes, irrespective of the quantity of materials required, are the following:—

Messrs. Nicholls & Clarke—The whole of the glazing.

Messrs. Webbs' Engineering Company (Birmingham)—The entire door fittings and window furniture, and the general ironmongery and taps.

Messrs. G. A. Williams & Son—The whole of the interior blinds.

Messrs. Diespeker & Co.—The mosaic hall flooring; whilst Messrs. Roberts, Adlard, & Co. have offered to lay the entire slates.

Numerous other presents for individual sections of the scheme have already been made. Among these are:—

The Expanded Metal Company—Metal lathing for exterior walls, floors, and partitions of the recreation house.

The Asbestos and Asbestic Company—Asbestic plaster.

The Columbian Fire-proofing Company—The first floor flooring of one house.

Messrs. G. Aston & Sons—Fifty cwt. of ironwork and some large girders.

Mr. E. Marshal Fox, for the British and London Non-Flammable Wood Companies—Non-flammable wood joinery and interior timber-work for the recreation house.

Mr. E. Lucas—A service lift.

Messrs. Strode & Co.—The electric fittings for one house.

The Conduit Insulation Company—Electric conduits.

Many of the leading builders of the metropolis have promised assistance and are only awaiting the particulars referred to above to determine their gifts. Among these are Mr. J. Howard Colls (Messrs. Colls & Sons), Mr. Geo. Trollope (Messrs. Trollope & Sons), Mr. H. Holloway (Messrs. Holloway Bros.), Mr. Stanley Bird (Messrs. S. Bird & Co.), and Mr. Randall (Messrs. Kirk & Randall). Numerous members and provincial firms have also sent in applications.

Mr. T. F. Rider (Messrs. T. Rider & Sons) has undertaken the onerous duties of honorary secretary to the stewards, and Mr. Sam Waring (Messrs. Waring & Gillow) has accepted a stewardship to represent the allied decoration and furnishing trades on the gift.

The management of the gift has been facilitated by presents of stationery from Messrs. A Mansford & Sons, of drawing materials from Messrs. A. S. Wilson & Co., of photographic work from Messrs. Ellis & Walery, and of lithography from Messrs. Sprague & Co. The executive much appreciate such contributions, as the administrative expenses are thus reduced to a minimum.

THE ARTISTS' WAR FUND.

THE exhibition of works of art contributed by artists, for sale, towards the War Fund, will open at the Guildhall on Monday the 22nd. We believe there has been a good deal of misapprehension on the subject, as if there were a huge sweep to be made of the possessions of poor artists. In the circular we have received from Mr. Spielmann, the hon. Secretary, it is stated that—

"It is the general belief of the contributors, based on previous experience, that they are likely to render more substantial help by the presentation of pictures, sculptures, &c., than by the gift of money, inasmuch as the work of their hands may be depended on to produce a larger sum than they could, as a body, otherwise so well afford.

After the close of the Guildhall Exhibition, the works of art will be removed to Messrs. Christie, Manson, & Wood's, who have most generously agreed to accept commissions, to devote their galleries for a whole week for the exhibition of the works in the West End, and then to dispose of them in a two days' sale—February 24 and 26—free of any charge whatever upon the Fund."

THE YORKSHIRE FEDERATION OF BUILDING TRADE EMPLOYERS.

THE second annual meeting and dinner of the Yorkshire Federation of Building Trade Employers took place at Leeds on the 11th inst. At the business meeting, held in the Builders' Exchange Club, Councillor W. Nicholson, of Leeds, presided, and the attendance of 100 included representatives from the leading centres in the county. Mr. Nicholson was elected to the presidency, and Mr. G. H. Walters, of Hull, and Mr. James Longden, of Sheffield, were elected vice-presidents. A sympathetic reference was made by Mr. Nicholson to the death of the late President (Mr. J. Spink, of Sheffield), and a vote of condolence with his family passed. The approval of the meeting was given to the proposed alteration of the rules of the National Federation to the effect that the members of the Council shall be elected from the county associations and not self-appointed, as at present.

Over 200 members and guests sat down to the dinner, which was served at the Queen's Hotel. As President, Councillor Nicholson was in the chair. After the loyal toasts had been honoured, Mr. G. H. Walters proposed "The Army, Navy, and Reserve Forces," to which Mr. Lewis Radcliffe (Huddersfield) responded.

Mr. James Townsley (Hull), in the absence of Alderman Jessop (Huddersfield), submitted "The Yorkshire Federation of Building Trades." Federation was, he observed, exactly what they chose to make it. Alluding to the struggles of the past year, Mr. Townsley said he did not think there would be any strike or lock-out for some time to come in Hull. It was not that they were afraid of that sort of thing, but the employers had learned many lessons, and the workmen too. Only a day or two ago he was told by a labour leader that they had learned lessons, and that on their side there was not likely to be any strike. At any rate, they had done some good as a federation, even though the results might not as yet be very apparent. After the struggle was over, and it was not quite over yet in Hull, they would settle down with a better understanding between capital and labour than had previously existed; and they should, on both sides, be less ready to take advantage one of the other, or to drive, either of them, the other side to extreme action. They had been brought somewhat nearer to labour right throughout the country, and out of this closer touch a very great deal of good would come. He believed firmly in federation, and quite apart from labour questions their Federation before the strike commenced was doing good work.

The President, in response, said that there was, in his opinion, only one thing which remained to make the building trade a success, and that was federation. He appealed to the secretaries of the associations affiliated with the Federation to give him their best assistance during the coming year. The Federation had not been formed for the purpose of overriding or of being antagonistic to anybody. Reviewing the past year, he reminded them that it had been a most trying one, especially in regard to disputes with labour unions. On the one hand, the masters wanted to be reasonable and fair; and, on the other hand, they found that the labour unions did not desire what was reasonable and fair. In one instance the course taken by the representatives of the employers was approved of by the leaders of the men's union in London, but when it was put to the full ballot of the workmen the proposal was refused. That, to his mind, was a pitiable state of things. It was said that "Force is no remedy," but he thought that saying was a fallacy. Force was a remedy, but as masters they did not want to use it. The Federation was not a philanthropic institution; it was not going to give members pensions or all that they might want, but it was going to be, so far as he was concerned, a business combination of masters. It would be worked on the same lines as they carried on their businesses. The present was a most trying time in the building trade. Since contracts were entered into some time ago there had been an enormous increase in the prices of material. Iron girders had advanced from 6*l.* to 8*l.* 15*s.* per ton, and timber from 50*s.* to 75*s.* per load of 50 ft., and Swedish, Norwegian, and Russian timber in proportion. This increase in the prices of building material, combined with the extremely high rate of wages which prevailed, would, he was afraid, seriously check the industry in which they were interested. He pointed out that the Federation could obtain many things which employers individually could not get. The executive of the Federation deprecated the idea of corporations and other local bodies executing works themselves. The ratepayers had a right to be considered, a right to obtain full value for their money, and the best way to get effective work was to let it in proper competition to builders. In regard to another matter, there was, unfortunately, a difference of opinion. If they did not make good men by way of apprentices, how could they expect the work

to be properly done seven or eight years hence? What they as a Federation should recommend was that every master was bound in honour to supply as many men as he could for the coming years. Every boy who went to a master must be legally bound, every chance must be given to the boy to turn himself out a skilful workman and worth the standard rate of wages. Any employer who did not do that was not doing justice to the building trade. Then there was the question of the foremen, who were the representatives of the employers. The policy of the trade unions had been to compel foremen to join the men's unions. What chance, therefore, had the employers to carry on their business successfully? The foremen must be freed from any baneful influence, and the executive hoped shortly to put forward a scheme by which the Federation would be able to give the foremen better conditions than the masters individually could. In conclusion, the President said they had arranged standard rates of wages in the various towns, and, compared with the payments in the other industries in Yorkshire, they were very good. As masters they had a right to ask that the men should give the best value they could in return for the high wages that they received. Let there be fairness on both sides.

The toast of "The Architects, Engineers, and Surveyors of Yorkshire" was given by Mr. W. R. Thompson (Dewsbury), and acknowledged by Mr. W. S. Braithwaite and Mr. F. Bowman.

Books.

A Manual of Church Decoration and Symbolism. By the Rev. ERNEST GELDART. With fifty-two plates and many illustrations by the Author. London and Oxford: A. R. Mowbray & Co. 1899.

MR. GELDART treats the subject of the temporary decoration of churches on special festivals with rather more of religious solemnity than we can quite enter into, but with his somewhat exaggerated zeal is mingled a great deal of common sense; and his book, beautifully got up and profusely illustrated, is really an exhaustive treatise on the subject, from the practical, the artistic, and the symbolical points of view. Moreover, if, as we gather from the title page, the majority of the illustrations are drawn by his own hand, he possesses talents as an architectural draughtsman which are quite unusual in an amateur.

The first chapter, on "The Principles of Decoration," commences with the incontrovertible maxim, often practically overlooked—"A church, after it is decorated, should be at least as fit for use as before," followed by some examples of the manner in which floral decoration is often (mis)applied so as to render font, reading-desk, pulpit, even communion table (Mr. Geldart says "altar," but there is no such word in the Prayer-book) unfit for their ordinary usage without serious inconvenience to clergy and others. He follows this by the equally uncontrovertible maxim—"Decoration must be harmless to the fabric;" nails should never be driven into wrought stone or woodwork; "if you cannot make a decoration stay in its place by the law of gravitation, or by the use of string or wire, take it away and find some other place for it." Numerous practical directions, evidently the result of experience, are given as to the readiest and most satisfactory way of making and fixing floral decorations. Among other points, we quite agree with the author as to the good effect of simple festooning along a horizontal line, such as the wall plate of the roof; as we agree with him also, on a later page, in regard to the clumsiness with which texts are often arranged over the extrados of pointed arches, where from the position of the letters they can seldom be conveniently read, and without any care being taken to see that the sentence is divided naturally and suitably at the apex of the arch. His suggestions for banners are good, and we cordially agree that if used for decoration (and nothing is more effective), they should be of good material and design, and that nothing is more unworthy of the situation than common and cheap flags. In the chapter on inscriptions some good specimens of alphabets are given as models, and a long list of texts suitable to various seasons is added. The chapters dealing with emblems form a considerable portion of the work. The author gives a list of all the principal emblems which have been used in connexion with the Christian faith; dealing first with emblems generally, and then with special emblems, such as those of the Trinity, the Passion, and the symbolical attributes of saints. It is needless to observe how much suggestion for decorative devices is included in this division of the subject.

We fully sympathise also with the remarks on brasses—the artistic beauty and literary reticence of the ancient ones as compared with the ugliness and garrulity of average modern examples. We are tempted to transcribe his typical examples of ancient and modern style (somewhat in the spirit of Pugin's "Contrasts"). This is the ancient:—

Orate pro aia. Joh. Smith qui obiit Jan. 2, 1896: a=aetatis suae 75° ✠

That is how John Smith's widow would have commemorated her husband had he lived 400 years ago. This is the modern style:—

In ever=loving
Memory
and as a token of undying affection
and lasting grief
his sorrowing
Widow
Has dedicated this window (representing
the taking up into Heaven of Elijah)
TO THE CHURCH
in which he worshipped
40 years.

That is a style of inscription with which we are certainly only too familiar in modern days; and as to the relative good taste and good feeling of the two there can be little question. We are tempted also to give an example (as a warning) of the author's own powers of finding symbolical meanings in simple architectural forms.

"A font has three shapes, and only three. It is circular, because the baptism is for the round world and them that dwell therein; or it is octagonal, because of the eight persons who were saved by water from perishing; or it is square, by reason of the north and the south and east and west, whence the regenerate shall come to sit down with the children of Abraham in the Kingdom."

This is truly symbolism run mad. But a few extravagances of this kind may be pardoned in a book which for the most part is really sensible and practical, and thoroughly well done. Without necessarily adopting all the author's views, those who are concerned in the decoration of churches would do well to study it.

Byzantine Constantinople: The Walls of the City and Adjoining Historical Sites. By ALEXANDER VAN MILLINGEN, M.A., Professor of History, Robert College, Constantinople. London: John Murray. 1899.

No apology need be offered by either publisher or author for the appearance of a new work upon this ancient city, the Queen of the East. From the mythical period of Byzas down to Abdul Hamid II. the world at large has always been greatly interested in everything pertaining to that city. The number, in fact, seems to be increasing of those who are fascinated with its chequered history and the story of its survival as the bulwark of civilisation for more than a thousand years, and as the object of the jealousies and rivalries of Europe for four and a-half centuries, and who are speculating as to the future destiny of the coveted prize.

While it is probably true that the greater number of such persons are interested chiefly in the historical narratives of what has there taken place, yet there is an increasing number who are interested also in the scientific study of the materials out of which history is made. They wish to study the topography which has been so important a factor in the history of that city. They are interested in the minutest details of its defences and fortresses, down to the very cement, which after so many centuries holds together those massive walls so tightly that the stones break rather than separate the line of cement.

To all such this magnificent volume of 361 pages, with its wealth of illustrations, carefully-drawn maps, and architectural plans, will prove a veritable treasure. It must not be supposed, however, that it is only intended for the technical reader. It is by no means a dry list of details. While there is an absence of all "padding," which the reader can supply for himself, the facts are well put together, and in an interesting manner, calculated to attract even those whose previous knowledge of the subject is but slight. No observant traveller contemplating a visit to the Imperial city can afford to be without this the most valuable book of reference found in any language upon the special class of topics upon which it treats.

The reader who is already somewhat familiar with the biography of the subject, will be specially grateful to the author for an important service which he has rendered in the collation of passages in the various Byzantine authors. He has, with careful painstaking, verified all his references from original sources, and has thus succeeded in correcting quite a number of mistakes of previous writers, some of them of venerable antiquity. The chapter upon the identification of the site of the Hebdomon is, in this respect, especially valuable.

Among the many other topics of special interest may be mentioned the Golden Gate, the Palace of the Blachernae, the Palace of Porphyrogenitus, and the Towers of Anemas and Isaac Angelus. The last-named subterranean prison of Anemas, so well known to the readers of Sir Walter Scott's "Count Robert of Paris," came near being the tomb of the author who in company with two friends happened to be caught in that extremely undesirable place at the time of the terrible earthquake of July, 1894. The incident which might have resulted so disastrously is modestly mentioned in a brief footnote, but the reader, who has followed the detailed description of those dungeons, will duly appreciate the danger of the situation.

This volume will excite in the minds of scholars the desire for more of the same kind of work done upon other portions of the city by the same masterly hand.

Wimborne and Christchurch. By the Rev. THOMAS PERKINS. London: George Bell & Sons. 1899.

A VOLUME containing illustrated descriptions of the Minster at Wimborne and the Priory at Christchurch, Hants, has been added to the "Cathedral Series" published by Messrs. George Bell & Sons. Both are buildings of great architectural interest, and the volume is copiously illustrated with reproductions of photographs of the many striking parts of the exteriors and interiors. Documentary evidence is scanty, but for the most part the various styles are strongly marked, sufficiently at all events to enable an approximate date to be arrived at. The descriptions are divided into chapters concerning the history, exterior and interior of the buildings, a fourth chapter, in the case of Wimborne, being devoted to an account of the small Hospital of St. Margaret, and a similar chapter on the Deans of the secular college, and an account of the Norman castle concluding the portion dealing with Christchurch. Of the many illustrations perhaps the best and most interesting are the exterior views of Wimborne before the restoration of 1891, and one or two of the interior views. The Norman nave at Christchurch is capitally illustrated, pages 96-7, and the views in the choir, and of the Salisbury and Draper chantries are also to be noted for their excellence of choice of subject and reproduction. Two ground plans at the end of the work are not up to the standard of the rest. The extent of the Norman work of each building is shown, but there is no key to the various dates, and no reference to the parts of the buildings or monuments, neither is there a scale. A little extra care in these matters would have added value to a work that has otherwise been well carried out; and in future editions it is to be hoped attention will be given to them. The volume is a handy and concise guide to two very fine churches.

The Daisy, or Cautionary Stories in Verse (1807). *The Cowslip, or more Cautionary Stories in Verse* (1811). Reprints. London: The Leadenhall Press. 1899.

SOME persons may still remember these two little books as circulating in nurseries in their childhood; already old-fashioned books for children, which however kept up a certain reputation for many years after their first issue. Then they disappeared and were no longer obtainable; and now Mr. Tuer has revived them as reprints at the Leadenhall Press.

Though the moral verses and anecdotes seem very quaint now, they are still calculated to amuse and interest young children; but our reason for noticing the books is on account of the old engravings which illustrate them, and which are really interesting as specimens of the book-illustration of the period. Though

naïve enough, many of them are very good specimens of black and white work in the thick line of the old-style wood engraver, and are worth having on that account. But why were the books not issued in their old brown covers with a cut of a daisy at the top? The parti-coloured wrapper in which they are now issued may catch the eye more, but it is surely not in keeping with the style of the printing and engraving.

We have received also from the same house, and in the same form, a reprint of "A New Riddle Book" (1778), but this we must confess we do not think was worth reviving, either for the rhymes or the cuts. It is different with "The Daisy" and "The Cowslip," which are really interesting examples of old children's books.

BOOKS RECEIVED.

THE YEAR'S ART: 1900. Compiled by A. R. C. Carter. (Virtue & Co.)

Correspondence.

To the Editor of THE BUILDER.

TILE FIXERS AND BRICKLAYERS.

SIR,—Will you allow me to put before your readers, and trade-unionists in particular, our position as tile fixers in recent disputes with the bricklayers, who have gradually and of late most persistently laid claim to tiling, both wall and floor, when it has been straightforward work and in large enough quantity.

They claim the work by saying that the size—viz., 9 in. by 3 in.—imitates brickwork, or else that all tiles are bricks, and therefore it is part of their trade to fix them, and threaten to strike if tile fixers are allowed to do the work.

In many cases the builders have been forced to give way and allow bricklayers to do the work, while the tile fixers, whose trade the only means of livelihood it is (all of whom have been working for years at it, and are thoroughly qualified to carry out all classes of work satisfactorily), are obliged to stand by and see a strong society (by means of its strength) gradually appropriate their trade. Remonstrances to them have proved useless, and have been treated with contempt, and we therefore appeal to all engaged in the building trade to give us their sympathy and support in upholding our right to what is, and always has been, distinctly the tile fixers work.

J. C. CARLEY, Sec.,
The Amalgamated Society of Tesselated Tile, Faïence, and Mosaic Workers and Fixers.

THE CLERGY AND ARTISTS' ASSOCIATION.

SIR,—A letter signed, "Edward S. Prior," published in the *Builder* of January 6, contains a statement concerning myself so extraordinarily inaccurate that I shall be obliged if you will publish this of mine, which contains the truth.

I was never a member of the Association except in an honorary way. I received all notices of meetings of the society till the meeting at Leighton House. If I ceased to be a member a "year ago," as Mr. Prior states, may I ask that gentleman and his colleagues why they still retain a valuable drawing by me, which they have been making use of as an advertisement for their society? I withdrew from the position I held as an honorary member at Leighton House, because I considered that there was not the slightest chance that the society would ever become one of importance from a national artistic point of view, and I have no reason to withdraw from that conviction.

W. B. RICHMOND.

Bemor Lodge, Hammersmith, January 13, 1900.

SIR,—My attention has been called to a letter from Mr. E. S. Prior in your issue of the 6th inst., which contains inaccuracies so remarkable that I am unwillingly compelled to trespass on your space, if you will permit me, in order to correct them.

1. There is no foundation for the statement that the members who resigned on December 15, and are now starting the "Church Crafts' League," desired to make the Clergy and Artists' Association "a missionary society for inspiring artists with certain clerical views."

2. There is no foundation for the statement that there was "a plot to swamp the general opinion of the members by setting up a permanent clerical direction of the society."

3. There is no foundation for the statement that "Sir Wm. Richmond had ceased for a year to be a member of the Association."

4. There is no foundation for the statement (as far as I am concerned) that "Miss Rope and Mr. Holiday had not as yet made themselves regular members." I do not know Miss Rope, but I am told the statement is as inaccurate about her as about myself.

5. There is no foundation for the statement that the Secretary "could only adjourn the meeting" because "there were present in the room several outsiders who declined to withdraw."

6. There is no foundation for the statement that "this unprecedented adjournment by the Secretary without consulting the Chairman" was supported by a majority present.

I will correct these inaccuracies categorically. No. 1 is too absurd to need refutation; but that and No. 2 are fully answered by a quotation from the proposed amendments to the rules, which the seceders had printed before the meeting on December 15, and of which I enclose a copy.

"A Committee of Direction, of which the President and Treasurer shall be *ex-officio* members .... shall have twenty other members, of whom ten shall be artist members and not less than five clergy members."

New artist members shall be "elected by the whole of the artist members of the Association." Mr. Prior does not explain how this composition was to ensure "permanent clerical direction."

3. When Sir William Richmond spoke at the meeting at Leighton House he was interrupted by Mr. Prior, who alleged that he had ceased to be a member because he had not paid his subscription. Sir William replied that he had been invited by the committee to be an hon. member of the Association, and had accepted on that understanding. This conclusive answer was not challenged.

4. I applied to the Secretary, Mr. Hallward, to be made a member, when I first heard of the "Clergy and Artists" from Mr. G. F. Watts, just after its formation. He informed me that I was enrolled, and has done me the honour ever since to apply for and receive my subscriptions (usually far in excess of the amount required as a condition of membership), he has sent me notices of all meetings and private invitations to speak at these. I may add that when I joined I wrote to many friends about the Association, and was fortunate enough to secure the adhesion of the Bishops of London and Rochester, Professor Ruskin, the Dean of Durham, and others. It is difficult to know what meaning Mr. Prior attaches to his own words when he states that I have not yet made myself a regular member.

5. The reason given by the Hon. Secretary for usurping the function of the Chairman and adjourning the meeting had nothing whatever to do with the presence of outsiders, the only mention of which was the case referred to above, which was immediately answered.

6. The Hon. Secretary claims that thirty members retired on his adjourning the meeting. The names of those who remained behind were all taken down, the number being thirty-one.

Very grave dissatisfaction had been felt with the manner in which the work of the Association was being conducted by the small majority of the committee who had control of its affairs, and it was decided to bring the subject before a general meeting and propose an amended constitution. To evade this issue, the Secretary, on a pretext unworthy of notice, prevented all discussion by the high-handed act of adjourning the meeting.

Those who valued the objects of the Association felt that it was impossible to work with a group who (to quote Mr. Prior) adopted this "dictatorial attitude," and determined to "swamp the general opinion of the members" by such methods as the above.

As a consequence of this act, Mr. Watts, Professor Ruskin, Sir Wm. Richmond, Mr. Conrad Dressler, and other artists, the Archbishop of York, the Bishops of London, Rochester, and Stepney, Canons Scott Holland and Gore, and other clergymen have resigned, with a large number of other members.

Mr. Prior seems to be much gratified that his "Association has been delivered from" such support.

Further comment on his letter is needless.

HENRY HOLIDAY.

Oak-tree House, Hampstead,
January 16, 1900.

"ANOTHER STRANGE COMPETITION."

SIR,—Seeing the letter with the above heading signed "Competitors" in last week's *Builder*, we beg to inform you that we prepared designs for the Billericay Rural District Council for additions to their hospital, and have been treated with the same lack of ordinary business courtesy as your correspondent, to whom please forward our name.

Cannot we recover our expenses, considering that the conditions of the advertisement inviting plans have not been complied with?

"ANOTHER VICTIM."

SIR,—The letter of "Competitors" as published in your paper of last week contains news for me, as I have been unable to obtain the result of this competition from the proper quarter.

The drawing and report I sent I took the precaution to have registered, so presume they reached their destination. I have written upon different occasions to the Clerk to the Council, but have received no answer to any of my communications.

Architects in general have much to put up with, but not to be shown the acts of courtesy customary in commercial life is more than even an architect expects.

I shall be glad if you will kindly forward my name and address to your correspondents "Competitors" for the purpose they name.

CECIL A. SHARP.

RE FIRE-RESISTING FLOORS.

SIR,—In your valuable article of December 23 on "Fire Prevention and Fire Tests" (which I have only just been able to read) reference is made to "light wood joists, *as allowed by the Act*, with a 5 in. filling of coke breeze concrete, ordinary boarding above, and light match-boarding below," as a "fire-resisting" floor.

Permit me to point out that nowhere in the Act is such a floor "allowed" as "fire-resisting." Section 74 requires such a floor to be "constructed of fire-resisting materials." These are enumerated in the second schedule, in which the L.C.C. has recently included coke breeze concrete in certain proportions where "used between joists." An impression seems to exist in the minds of some architects, and has been expressed to me, that this legalises wood joists for such a purpose; but all that was done was to place such concrete in the same category as ballast concrete, bricks, stone, iron, steel, &c., and in no way affects the character of wood joists as "combustible material," any more than classing slates as non-combustible would make wooden rafters fireproof.

Such a floor as first named would certainly not comply with the Act, and, as this is an important point, I should be glad if you will find space for this letter.

DISTRICT SURVEYOR.

"A LOST PRINCIPLE OF BEAUTY IN ARCHITECTURE."

WE have received a long letter from Mr. Julian Moore, author of a paper under the above title in the *Fortnightly Review* for December, complaining that we did him injustice in saying (under the head of "Magazines and Reviews") that his paper was "nothing more than the theory of curved lines and irregular setting out of everything" repeated over again. We cannot give space for a long letter re-stating views which we regard as absurd; the special point is that Mr. Moore was not merely re-stating Mr. Penrose's Greek curves, or anything of that kind. Our sentence may have conveyed that impression, but we knew quite well what Mr. Moore meant; and though it may be new to the Editor and many readers of the *Fortnightly*, it is not new to us. Professor Goodyear has been at it for years, and we have frequently commented on his extravagant suggestions of taking ever so many settlements and irregularities of line in ancient buildings as intentional and for the purpose of effect. Architecture is not such a fudging kind of art as this, and amateurs who are enthusiastic, like Mr. Moore, for possible beauties which they do not find in much modern architecture, would escape some pitfalls if they bore in mind the simple fact that every old and picturesque and crooked building was once brand new.

The Student's Column.

DETAILS OF STRUCTURAL IRON AND STEEL.

3.—IRON EXTRACTION (*Continued*).

PATTERN-MAKING is a mechanical art requiring for its successful practice a fair knowledge of practical plane and solid geometry. It is also necessary that the pattern-maker should be acquainted with the nature of woods or other materials used, with the characteristics of the metal to be cast, and with the details of operations performed in the foundry. Architects who are wise in their generation will, as far as possible, use castings from stock patterns, such as are available in great variety. Patterns made from architects' drawings are not invariably satisfactory. Important castings are occasionally known to fail entirely because of weakness due to imperfect design, and others, again, are often observed whose excessive bulk does not necessarily present any advantages except to the iron-founder. Defects of this nature indicate that the designer has attempted work beyond his powers. If the architect has not studied the details of pattern-making, he will do well to employ some master of the craft, and confine

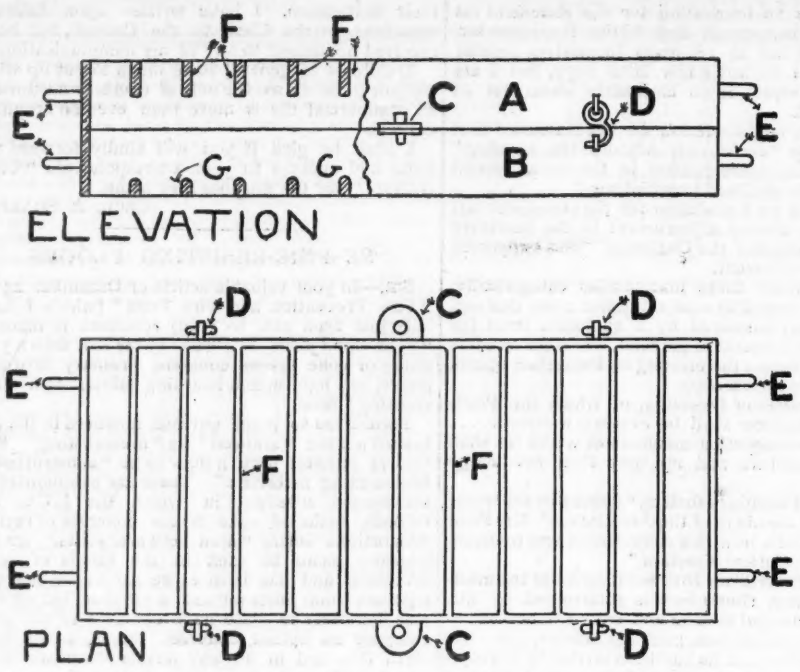

Fig. 6.—Elevation and Plan of Moulding Box.

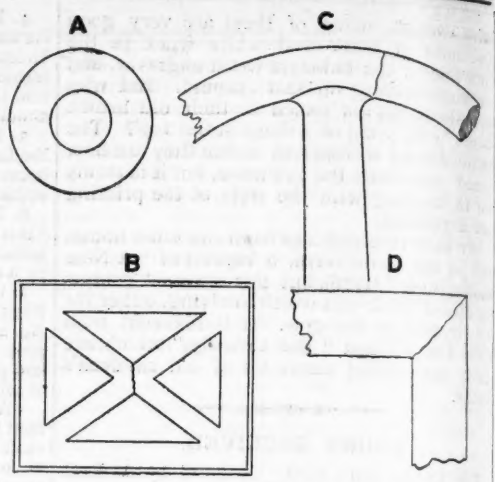

Fig 7.

his own efforts to giving general directions. Of course, occasions constantly arise where it is absolutely necessary that the architect should furnish designs for castings, especially in connexion with ornamental work; but in such cases it is advisable that the pattern-maker should be allowed as much latitude as may be possible, so that sentimental and practical art may be equally exemplified. A competent pattern-maker may always be trusted to make due allowance when required for shrinkage of the iron during cooling; he will also see that patterns are "drafted," so as to permit of their ready withdrawal from the mould; but it is not always within his power to avoid the expense which a comparatively insignificant alteration of the design might render possible, nor is he invariably at liberty to modify features, whose only effect may be the production of weakness, as the result of unequal molecular strain. It would be difficult to overstate the importance of designing castings so that their lines may be in general harmony with the natural laws of crystallisation brought into operation during the cooling of the metal. Without intending to enter fully upon this question, we think it very desirable that attention should be directed to the following interesting points. Cast iron is a body, which, in the act of cooling, follows the laws of crystallisation, more or less exactly, according to attendant circumstances, and it is found that the planes of crystallisation assume a direction identical with that along which heat has passed outward from the cooling metal. In a cylindrical bar the crystals radiate from the centre; in a square bar they are perpendicular to the sides, consequently a kind of mitre-joint exists at each corner forming a line of weakness, and a similar effect occurs in a flat plate having square corners. From these facts the reader will at once draw the inferences, (1) that the forms best calculated to promote strength are those most nearly related to the circle, or, better still, to the sphere; (2) that all sharp angles should be avoided, in order that the metal may flow in curves of easy gradation; and (3) that uniformity of thickness should be preserved as far as possible. As we shall afterwards show, the ironfounder sometimes has it within his power to assist the designer with regard to the direction in which crystallisation takes place.

Moulding, as practised in the iron foundry, includes the formation of matrices into which the molten metal is poured. The moulds can be used only once, as they are broken up for the removal of the casting after cooling. Iron moulding is performed either in sand or in loam. When the former material is employed, a pattern is required; when the latter is used, a pattern is usually dispensed with, the mould being built up and shaped in accordance with templets by hand-tools and mechanical appliances. Green-sand moulding is the method adopted in the case of all ordinary castings, and the term implies the fact that the sand is used in its natural condition, and that the mould is not dried or baked before use. Dry-sand moulding is practised when heavy castings of exceptional solidity are to be produced. The sand is then specially prepared, and the finished mould is dried or baked in a stove. Loam-moulding is specially suitable for the production of such castings as columns, cylinders, pipes, &c., for which patterns may be either costly or unnecessary, or both. Finished moulds can generally be removed to the stove for drying; but when this course proves to be impracticable, they are dried by the aid of fires made beneath them in the moulding shop.

In the ordinary way, moulding is accomplished by the aid of rectangular frames, fitting together in pairs or in stacks of three or more, and provided with dowel pins so that they may be separated and re-united in their previously relative positions. These frames are termed "flasks," or "moulding-boxes," being made of cast iron with lugs, by means of which they may be readily lifted. Small boxes are entirely open both at top and bottom; but in the case of large boxes, cross bars are formed in such a manner as to aid the retention of sand. Fig. 6 illustrates a pair of moulding-boxes where (*a*) is the top flask or "cope," (*b*) is the bottom flask or "drag," (*cc*) are dowel pins, (*dd*) hooks and eyes for holding the flasks together, (*ee*) are lugs, (*ff*) are cross-bars on the cope, and (*gg*) are cross-bars on the drag. With properly made patterns of good design, moulding is of course easy and reasonably inexpensive. When an object of fairly symmetrical shape has to be moulded, a cope is laid with the lugs uppermost and filled with sand, which is rammed tightly and struck off level. A portion of the sand is then scooped out so that the pattern may be imbedded, approximately as far as the centre line; some sand, free from clay and described in the shop as "parting-sand," is sprinkled over the surface for preventing adhesion between the two halves of the mould, and the other flask or drag is laid in place. Facing-sand is then sifted over the projecting portion of the pattern until it is completely covered and the box is filled from the top with old sand, which is well rammed in and struck off level. Provision is made for the escape of gas through vents pierced in the sand by a piece of steel wire. The two flasks are inverted upon a level surface, and the cope, in which the pattern was first embedded, is taken off and emptied. A parting-line is then established by the addition or removal of damp facing-sand. This line may be either straight or otherwise, according to circumstances, but it must always be formed so that the imbedded and exposed portions of the pattern slope away from it towards its vertical axis. From the parting-line the sand extends as a plane or sloping surface to the edge of the flask; over this surface parting-sand is sprinkled, the cope is replaced, and after a "runner-stick" has been placed in a suitable position, facing-sand is introduced and the box is filled and rammed as before described. Vents are then made, and the removal of the runner-stick leaves an opening known as the "gate," through which metal is poured into the mould after the pattern has been removed. When hollow castings are required it becomes necessary to use cores, and if these are properly supported in position, the castings should be of the anticipated thickness at all parts. Unfortunately, like other things animate and inanimate, cores do not always behave exactly as may be expected of them, and are liable to become misplaced. This eventuality is one for which the architect or engineer must be prepared, and as the chief weight of a building often rests upon cast-iron columns, it is very important that such members should be subjected to careful examination before use.

The work of the moulder may be much facilitated by the careful patternmaker, who makes all parts of the model smooth, so that the moulds may be perfect. His patterns are made so that certain parts requiring exceptionally good metal shall be cast in a position where the greatest pressure exists during pouring, and that impurities shall therefore rise to less important parts. He also indicates the special treatment required for different parts of a pattern; thus the moulder may know where extra care is necessary in the preparation of the mould, and where his gate or gates may be most suitably placed. Similarly, the work of the founder depends largely upon both the pattern-maker and the moulder. So far as the intrinsic strength of the metal is concerned, everything depends upon the suitable combination of various qualities of iron, and upon the work done in the cupola. The strength of the metal when cast is governed chiefly by intrinsic strength, partly by the suitability of the pouring, feeding, and other gates, and partly also by the judgment and skill evinced by the founder with regard to pouring and cooling. Strength of the casting, regarded from a purely constructive point of view, depends, of course, entirely upon the designer, although, looking at the casting as a whole, it is quite possible for the intention of a good design to be frustrated by indifferent metal and workmanship; or, on the other hand, for a bad design to triumph over the best material and the most careful manipulation. It is the duty of the founder to provide metal possessing the requisite strength and the quality of flowing readily into all parts of the mould; he must also exercise judgment as to the proper temperature at which the metal should be poured. Pouring at too high a temperature tends to reduce the closeness of the grain and the specific gravity of the metal, as well as to exaggerate unavoidable planes of weakness, to which previous reference has been made. On the other hand, if poured at too low a temperature the metal is apt to be "cold-shot," which means that continuity of the casting is interrupted by seams or imperfect joints, resulting from rapid congelation in the mould. Again, the founder should do all that is in his power to modify the formation of planes of weakness due to crystallisation by accelerating the cooling of some portions of a casting, and by retarding that of others. This proceedure is not always possible, but by the exercise of discrimination injurious action may often be minimised.

For the purpose of making this matter clear sketches are given in fig. 7 of four typical

castings. In the case of A, representing any thick cylinder, the outer portions of the metal are naturally the first to cool; and, owing to the subsequent cooling of the inner parts, there will be unequal strain, the outer parts being under compression and the inner under tension. If, however, arrangements can be made for retarding the cooling of the outer layers of metal, and simultaneously for accelerating that of the inner layers, the cylinder will be considerably strengthened. Taking a casting such as B, we find the diagonal rails tend to shrink less rapidly than the outer rigid frame, and consequently fractnre is likely to occur at the centre.

A different effect occurs during the cooling of a wheel casting C. If the arms cool first they will act as rigid struts resisting contraction of the rim, which may be ruptured on the line indicated. On the other hand, if the wheel has a thin rim cooling more quickly than the arms, the latter may be broken by tension.

The sketch D shows the line of weakness previously described, in a flat casting with square corners, resulting from crystallisation in directions perpendicular to the surfaces. In such a case the founder can do very little in aid of a badly designed casting.

Before leaving this section of our subject, mention should be made of two descriptions of iron castings, both of which are to some extent used in architectural work. *Chilled castings* are largely employed by engineers, and are produced by the means of special moulds designed to convey heat very rapidly from the molten metal. Thus the outer portions of the castings assume a state similar to that existing in white iron, whilst their interior parts remain in the form of grey iron. In this way castings are furnished having great resistance to crushing stress. Although such a process is not intentionally applied to castings used in building construction, yet a similar effect, though in a very modified degree, is caused by the ordinary methods of foundry practice. All castings have a skin, which is really a chilled surface, and this adds considerably to their strength, besides offering a better resistance to oxidising influences. *Malleable cast iron* is another useful and convenient form of the metal, obtained by heating of specially mixed metal castings to a red heat in contact with powdered red hematite ore, for a period of four or five days, at the expiration of which they are allowed to cool very gradually. During the process, the quantity of carbon in the cast iron is diminished, owing to combination with oxygen contained in the hematite, and the result is the formation of a kind of steel, or semi-steel, which is to some extent malleable, and may be bent or hammered without injury.

Cast iron is of so variable a nature that its composition can only be stated in a very casual manner. For the purpose of comparing cast iron with other composite substances, such as malleable iron, steel, and so-called steel, the following table may, however, be found of service :—

Table IV.—Approximate Composition of Cast Iron.

Carbon ...	2·0	to	4·5	per cent.
Silicon ...	·15	„	5·0	„
Sulphur ...	·0	„	·5	„
Phosphorus	·0	„	1·3	„
Manganese	·0	„	1·5	„
Iron ...	90·0	„	95·0	„

OBITUARY.

MR. W. H. PICTON.—The Liverpool papers record the death last week, at the age of sixty-three, of Mr. W. H. Picton, architect, of Liverpool. Mr. Picton was the son of the late Sir James Picton, who, as many of our readers are aware, had a remarkable career in Liverpool as an architect and a public man, having worked his way up, by his own energy and ability, to a prominent position. Mr. W. H. Picton was educated in his father's office, and was a partner in the firm of Picton, Chambers, & Bradley, till its dissolution in 1890. After practising for a short time separately, he retired, and subsequently devoted himself mainly to philanthropic work in Liverpool. Mr. Picton was a Fellow of the Institute of Architects, and was associated with his father in the design and erection of some of the large buildings carried out by the latter before he had relinquished practice. Mr. Picton was a man of singular amiability and gentleness of character, who was always ready to assist any scheme for the public good and especially for furthering the education and interests of the working classes, and who will be regretted by all who knew him.

MR. T. MORRIS.—The death has just occurred of Mr. Thomas Morris, builder, Shrewsbury. The deceased, who was sixty-seven years of age, was apprenticed to the late Mr. H. Thomas, of St. Austin's Friars, and he became a partner in the firm in 1859, and some eight or nine years later he commenced to carry on the business alone. Since that time he was entrusted with many works in the town and county, among which may be mentioned the new wing and additions to the Salop Infirmary, the Shrewsbury Branch of the National Provincial Bank, the restoration of the Shrewsbury Free Library and Museum, the building of the Pontesbury Police-court, &c., the reconstruction of upwards of eighty shops in Shrewsbury, also many warehouses, villa residences, farm buildings, mission rooms, and schools in different parts of the county. Amongst his last works were the New Theatre Royal and the extensions at the Abbey Foregate Congregational Church. In 1897 he was elected President of the local branch of the Master Builders' Association.

MR. GEORGE FURNESS.—It is with regret that we have to record the death, on Tuesday morning last week, of Mr. George Furness, one of the few surviving representatives of the old-fashioned type of contractor. He had been suffering from bronchitis for some months past, but influenza was the immediate cause of death. Born in the year 1821, in Derbyshire, Mr. Furness gave at an early age such conspicuous evidence of his business ability that he was entrusted with public contracts of great importance. Amongst his earlier undertakings may be mentioned a large railway contract in the Midlands about 1842, the building of a French railway line in association with the late Thomas Brassey, and the restoration for the Russian Government, at a cost of about 750,000*l.*, of drainage works, paving, &c., at Odessa after the termination of the Crimean War. For thirty years also he was engaged in extensive dredging operations at Spezia for the Italian Government. Amongst other railway contracts carried out by him the building of the Pernambuco Railway, in Brazil, and the extension of the South Eastern Railway to Port Victoria are the best known, the latter being his last important undertaking. Mr. Furness constructed a large portion of the Thames Embankment, and of the main drainage works of London. In recognition of his services to the State Mr. Furness was made a Cavalier of the Crown of Italy by King Victor Immanuel, and in 1864 he was elected an Associate of the Institution of Civil Engineers. Although an entirely self-made man, Mr. Furness remained unspoiled by the great wealth he had acquired. He was a resident of fifty years' standing in Willesden, where he was one of the largest freeholders, and owned the Willesden Brick Works. He was universally esteemed in the district and county for his private philanthropy and for his public services both on the Local Board and on the Middlesex County Council.

GENERAL BUILDING NEWS.

ST. DAVID'S CHURCH, EXETER.—The Lord Bishop of Exeter consecrated, on the 9th inst., the new Church of St. David's, Exeter. It consists of nave, 107 ft. long by 48 ft. wide; north and south transepts, 18 ft. by 12 ft.; chancel, 43 ft. by 23 ft.; chapel (north side of chancel), 43 ft. by 21 ft.; and aisle and clergy vestry on south side of chancel, occupying about the same area as the chapel. The structural portions on the north and south sides of the chancel are separated from the chancel by ambulatories, which are in line with ambulatories formed out of the internal buttresses on the north and south sides of the nave, and which latter serve as passageways for the congregation. Over the aisle on the south side there is an organ loft; in the tower on the north side at a similar level is a muniment room, and above the latter is the belfry. In the east-end basement are a choir vestry, heating chamber, and room for apparatus for organ-blowing. The tower is about 100 ft. high. The seating accommodation is as follows: Nave, two blocks of 327 each; south transept, 42; north, 25; chapel, 55; south aisle, 29; choir, 30; galleries, 65—total, 900. The walls are of limestone, quarried at Westleigh, near Wellington, and Babbacombe, with dressings and internal facings of Bath stone from the quarries of Yockney & Co., Corsham. Shafts carrying the tower are of Portland stone. There are six entrances for the congregation—four at the west end, and one each on the north and south sides—with an internal series of leather-covered folding doors. An entrance for choir and bellringers is provided at the east end. The ancient font, belonged to a former St. David's Church, but has for many years been utilised as a pump basin or trough at the Barnstaple Inn, Exeter. The chancel, as far as the communion rails, is paved with marble. On either side are carved solid oak choir and clergy stalls. Inside the communion rails there is a pavement of Opus Alexandrinum. On the south side there is a sedilia, with carved canopies of stone. Over the altar table there is an oak reredos. In the centre are two large panels, the lower depicting the Crucifixion, and the upper the Throned Saviour in majesty. Decorative panels, with figures of Apostles and Saints in canopied niches, adorn the sides, the whole being crested with bands of carving. The roof in the nave is constructed partly in stone and partly in wood, with stone arches as principals springing from stone columns on the arcade piers by the passageways. The long line of roof is thus divided into bays. Between these principals is a barrel-shaped ceiling with a moulded cornice broken at regular intervals by angels with outstretched wings and holding shields. The roof of the chancel is similar in character, and is divided into two compartments, with a moulded stone arch. There is a waggon-headed ceiling, with recessed panels and carving at the intersection of the ribs, as well as carved friezes at the springings. At present most of the windows are filled with ordinary glass, but the chapel, the west-end, and the south aisle windows possess stained glass. Low-pressure hot water has been adopted for heating purposes. The gutters are lined with asphalt instead of lead. The peal of eight bells, which was hung for ringing purposes in the last church, has been re-hung in the tower of the new building, in a new frame with new fittings. The church is lighted in a somewhat novel manner by electricity, the scheme being devised and the fittings designed by the architect, Mr. W. D. Caröe, of London, whose plans for the church were placed first in competition, while the following have carried out the work associated with their names :—Mr. W. Dart, Crediton, building and general fitting; Messrs. Hubber & Son, Exeter, electric lighting; Mr. Stokes, Woodbury, bell-hanging; Messrs. Wippell Bros. & Row, Exeter, heating apparatus; Mr. C. E. Kempe, London, stained glass windows; Messrs. Bradshaw & Son, Exeter, asphalte; Messrs. Lee Bros., Bristol, marble and mosaic pavements; Mr. N. Hitch, London, figure carving in choir stalls and reredos. Mr. J. Powell has been clerk of works; Mr. S. B. Francis, builders' manager; Mr. F. Smith, builders' foreman. The actual building of the church has cost 12,000*l.*; lighting and seating, 1,300*l.*; while the total outlay has been 15,600*l.* The building was illustrated in our issue for September 19, 1896.

CHURCH, ROUNDHAY, LEEDS.—A new church is to be erected at Roundhay, Leeds. A site consisting of some two and a half acres, in what is known as Lidgett Park, has been given, and plans are now being prepared by Mr. W. Carby Hall, architect. A parochial hall to accommodate 350 persons is in the meantime to be provided, and it is expected that this will be ready about September next.

SCHOOL, SHEFFIELD.—A school in Pomona-street, Ecclesall-road, has just been erected for the Sheffield School Board. The building has been erected by Messrs. Murgatroyd & Sons, of Bradford, from designs prepared by Messrs. Holmes & Watson. It is a mixed school with accommodation for 590 children, and the total cost, including a site of two acres, is 12,750*l.*

MODEL SCHOOL, CARDIFF.—A new Board school at Marlborough-road, Roath, Cardiff, has just been opened. It affords accommodation for 1,350 pupils. The school has been built on the central-hall system, with class-rooms leading out on all sides. It also has cookery kitchens and a laundry. In addition, a school for manual instruction has been added. The architects are Messrs. Habershon, Fawckner, & Groves, of Cardiff. The contractor is Mr. David Davies, of Cardiff, the amount of his contract being 19,666*l.*

NEW BUILDINGS, INVERNESS.—On the 8th inst., at the Dean of Guild Court, plans were passed for the erection of a large block of buildings in Church-street and Queensgate. The block will be about 240 ft. in length, and will be four stories in height. On the street level there will be shops, and on the upper floors there will be offices, while accommodation is to be made for a hotel in the centre of the building. The cost of the block is estimated at 25,000*l.* Mr. W. L. Carruthers is the architect.

A ROWTON HOUSE FOR LIVERPOOL.—On the 11th inst., the Earl of Derby opened at Liverpool a "People's Home," based on the model set by Lord Rowton in London. "Bevington House" is situate in Bevington Bush, near the west side of St. Martin's Market, Scotland-road. By the side of the entrance-hall is the memorial stone, laid by the late Mr. T. H. Ismay, in June, 1898, and over the door are inscribed the words "Bevington House," flanked with terra-cotta relief designs. The building is six stories in height, and has been built from the designs of Messrs. C. O. Ellison & Son. Its accommodation is for single men, and comprises 500 cubicles, or sleeping apartments. There are two large kitchens, with a number of cooking stoves, and the lodgers may bring in their own victuals and cook them or may purchase them at cost price. Close by is a large dining-room, as well as reading and recreation rooms. In the basement are large apartments, which, like the staircase, are lined with vari-coloured glazed bricks. Here are the resources for washing and the repairing of clothes, which may be done by the men themselves or by tailors and shoemakers. Each sleeping apartment is 7 ft. 6 in. by 5 ft.

THE LONDON HIPPODROME.—The London Hippodrome, half circus, half theatre, was opened to the public on Monday. The building occupies a site at the corner of Cranbourne-street and Charing Cross-road, and there are frontages also to Newport-street and Ryders-court as well. The frontage to

Cranbourne-street is utilised for shops, and offices or bachelors' flats; and to a less extent the frontages in Charing Cross-road and Newport-street are similarly treated. To a stage of unusually large dimensions has been added an arena, or circus-ring, capable of being converted, by mechanical arrangements, into a tank, with a depth of 8 ft. and a cubic capacity of about 100,000 gallons. A series of hydraulic rams serve to raise and lower the stage proper and the floor of the arena; and by their means, also, a grill, some 15 ft. high, can be elevated to shut in the arena during the performances of wild animals. Entering the tank at the bottom are eight fountains capable of throwing jets of water 20 ft. high, and these jets are illuminated by limelights arranged in a gallery in the centre of the roof. In order to permit a good view both of the stage and of the arena to be obtained from all parts of the house, the plan of the auditorium, which provides accommodation for over 3,000 persons, has had to be drawn on special lines. The tiers of seats are concentric with the arena, and are arranged in steep ascent. The stalls and boxes, which form the ground floor, are set back under the grand circle, above which rise the amphitheatre and gallery. The seats in the upper parts of the house are roomy. As the arena leaves no room for the orchestra in front of the stage, place has been found for the musicians on the left-hand side of the grand circle. The decoration of the building has been carried out in the Flemish Renaissance style. There is a sliding roof in the dome, and the house is lighted throughout by electricity. The architect of the building is Mr. Frank Matcham, and Messrs. Holliday & Greenwood were the builders. In the furnishing and upholstery Messrs. Maple, Campbell Smith & Sons, Cranstone & Elliott, and Davis & Co. have taken part.

ARTISANS' DWELLINGS IN DUBLIN.—With the end of the past year the movement for the housing of the artisan and labouring classes in Dublin at rents within their power to pay, has made very gratifying progress, says the *Irish Times*. In many parts of Dublin great improvements in this respect have been made by the Corporation in various directions in the city, such as those effected at St. Joseph's-place, Dorset-street, formerly White's-lane. During the year 1899 the plans for 102 small houses suitable for artisans and labourers were lodged with the City Architect, most of which were approved of. They were the inception of private enterprise on the southern side, and at the close of the year many of them had been finished and occupied, the remainder being actively proceeded with. By this movement some 400 additional members of the working classes, allowing five persons in each family, had been housed in comfort and decency, with proper sanitary appliances in their residences, at rents ranging from 4s. to 5s. 6d. per week. During the year Guinness's Trustees lodged with the City Architect plans for 100 separate tenements in two separate blocks, which were approved. The clearance of the Bride's-alley area will be one of the largest and most important improvements yet undertaken in Dublin. This is perhaps the most congested and neglected district in the city, containing for its extent a vast number of the artisan and labouring classes. During the necessary alterations, and to provide accommodation for the displaced tenants, suitable houses, with a sufficiency of tenements, will be provided, each consisting of two or three rooms, at rents averaging from 3s. 6d. to 6s. a week. According to a report presented to the Municipal Council in March last by the Artisans' Dwellings Committee, the cost of acquiring the site was 35,000*l.*, the clearing away, &c., with the construction of new roads and streets, 9,000*l.*; and for the provision of accommodation for the displaced inhabitants and artisans and labourers generally, 47,000*l.* The total cost of the schemes was then estimated by the Committee at 91,000*l.*, being an increase of 28,000*l.* over the estimated cost of the original scheme. Between the operations of the Artisans' Dwellings Company and the efforts of the Corporation Committee, a vast improvement has taken place in the residential condition and home comforts of the working classes. Both of them have always kept one important object in view in the erection of their houses for the working classes—the provision of proper sanitary appliances for each dwelling, the result being that in the present heavy death-rate in Dublin fewer cases, in proportion to the number of inmates, have come from them than from many other quarters of the city.

MISCELLANEOUS.

PROFESSIONAL AND BUSINESS ANNOUNCEMENTS.—Messrs. Abel & Imray, consulting engineers, of Birkbeck Bank Chambers, London, have taken into partnership Mr. Arthur G. Bloxam, Fellow of the Institute of Chemistry and Fellow of the Chemical Society. The firm will continue to be known as "Abel & Imray."——Mr. James Gandy, surveyor, of 22, Essex-street, Strand, has taken into partnership his former pupil Mr. Roland Edward Bennison. The firm will be known as "Jas. Gandy & Bennison."

HALIFAX BUILDERS AND THE "ONE-HORSE ONE-MAN" RULE.—A deputation from the Halifax Builders' Exchange waited on the Corporation Tramways Committee on the 11th inst, and asked for the omission from the Corporation Parliamentary Bill of the clause which prohibits one man having charge of more than one horse at a time, as it would seriously affect contractors. The Committee resolved to refer the matter to the Watch Committee, but this Committee recently decided to adhere to the clause

FUEL-SAVING IN HOUSE FIRES.—The "Domestic Crater Fuel-Saver" is a simple contrivance made and patented by the Domestic Crater Company (London). It is a small iron tunnel-shaped grating to be placed on the bottom of the grate, where it rises in the centre and both takes up some of the space otherwise filled up by coal, and (which is much the more important point) keeps open a clear space for the passage of air to the centre of the fire, with the view of keeping up complete combustion and preventing smoke and consequent waste of fuel. The single tunnel specimen is intended for the smallest domestic grates, for larger ones there is one with two ridges and tunnels (a specimen of which has been sent to us), for the largest grates one with three tunnels. We have not so far experimented with it, but it is a thing on a right principle, and simple in its application.

PROPOSED SCHOOL OF ART FOR HULL.—At a meeting of the Art Sub-Committee of the Hull Technical Instruction Committee, held in the Town Hall on the 12th inst., the Clerk laid upon the table the report of a deputation appointed to visit certain schools of art in other towns, in order to find the basis of a scheme of reform. From this report it appears that the deputation visited the Municipal Schools of Art at Birmingham, Manchester, Leicester, Derby; and in London the Camberwell School of Arts and Crafts, Putney School of Art, and Battersea Polytechnic; also the new branch School of Art, Moseley-road, Birmingham. They recommend that a new school should be built, central in situation to avoid building branches in the future as much as possible; that it should contain an art museum and cast gallery if possible, and be near the Art Gallery and Free Library; that it should be made the centre of all art teaching and organisation for the district; that it should accommodate at least 200 day and 250 evening students, and consist of a basement and two floors mainly, be lighted from the north, north-east, or top, and by electricity at night (gas also). From the experience gained during their visits, the deputation are of opinion that the cost of site and building for a suitable school for Hull would be from 15,000*l.* to 17,000*l.* The report was ordered to be referred to the Finance Committee, with the view of having it brought before the Council.

NEW CLOCK, WALKDEN. — The Bridgwater Trustees are about to have a large clock erected over their offices at Walkden, near Manchester. It will have four 7 ft. dials, which will be illuminated by electricity and strike the hours. The clock will be generally after the designs of Lord Grimthorpe, and is being made by John Smith & Sons, of Derby.

SURVEYORSHIP APPOINTMENT. — Mr. Herbert Beeney writes to say that it was he, and not Mr. Dunch, as stated in our paragraph on page 44 last week, who was appointed Assistant Surveyor to the Barking Town Urban District Council. There was some confusion in the statement owing to the name of Mr. Dunch appearing on the official paper on which the communication was made, and we seem to have inserted the wrong name.

FIRST AID TO INJURED WORKMEN.—Mr. A. W. Itter, the owner of the Great Eastern Brickworks near Peterborough, has instituted a system which might very well be followed in places where there is much machinery and many men about, and where consequently accidents are not infrequent. Thinking that it would be much better if aid could be given to an injured man on the spot, instead of his being taken away to Peterborough Hospital four miles off, he engaged a medical man to give a series of lectures to the whole of the workmen on first aid to the injured, especially with reference to accidents from machinery. After the series was concluded the St. John's Ambulance Association was requested to send a medical examiner to question and examine such workmen as chose to offer themselves, and as a result a large number of the workmen were a few days since presented publicly with certificates from the Ambulance Association. This is a proceeding at once common-sense and truly philanthropic, in the best sense of the word.

THE REGENT-STREET POLYTECHNIC. — On the 12th inst., Colonel R. W. Edis, F.S.A., distributed prizes and certificates to the students of the Architectural and Mechanical Engineering Classes of the Regent-street Polytechnic. Mr. R. Mitchell, Director of Education at the Polytechnic, made a brief statement of the work done last year. The governing body of the Polytechnic, he said, reported that the session 1898-99 had been a record one in the annals of the School of Architecture. Greater numbers of students had been in attendance than at any session heretofore, and at the examinations of the Science and Art Department, the City and Guilds, and the Company of Carpenters, had exceeded their most sanguine expectations. In the School of Engineering also great progress had been made. The number of students attending the classes in that section represented a sensible increase compared with past years. By the aid of the Technical Education Board of the London County Council a mechanical library had been added, making the department more useful in increasing the efficiency of the institution in mechanical science.—Miss Edis having presented the prizes and first-class certificates, Colonel Edis congratulated Mr. Mitchell and the students on the magnificent success of the school. He pointed out that technical knowledge of some kind or other was always useful. The great curse of the present moment, to his mind, was trades' unionism. He had worked at his profession, as an architect, for forty years, and he remembered the days when masters and men were at one, and each had respect for the other. He knew that the work was infinitely better done then than it was to-day.

CAPITAL AND LABOUR.

THE EDINBURGH AND LEITH BUILDING TRADE—The reduction of wages agreed to by the Edinburgh Master Builders' Association affects masons, joiners, bricklayers, and plumbers, and will not come into operation for some little time yet. When the reduction does come into force, it means 4s. less a week for each operative. According to the agreement with the Masters' Association, the joiners get three months' notice if any change before the 15th of this month; the masons, two months' notice, to be given April 6; the bricklayers, notice to be given before February 1, the change to take effect on May 1; and the plumbers to receive notice by March 1, to take effect on June 1. As the men have not yet received official notice of the resolution of the masters to reduce the wages by one penny per hour, no action has so far been taken on their part.—*Scotsman.*

ABERDEEN MASTER PAINTERS AND THE STANDARD RATE OF WAGES.—The Master Painters' Association and the operative painters have both been considering the rules of agreement which were signed last year by both parties relating to wages and work. The men, after full discussion and considering the advance which they received last year after a short strike, decided that they should demand no further changes. The masters, however, have been much concerned about the working of the rules relating to the standard rate of wages and what is known as country money. At present the standard rate in Aberdeen stands at 8d. per hour. No master would refuse payment of that rate to a good workman, and, as a matter of fact, first-class operatives receive as much as 9d. to 10d. an hour. What the masters object to is that they should be compelled under the by-laws to pay inferior workmen at the standard rate. Whilst it is recognised that one of the principles of trades unionism is involved in this question, they point to the practice in Edinburgh, Glasgow, and Dundee, where second-rate workmen are not necessarily paid at the standard rate. They maintain that as a matter of equity a man of little experience should not receive the same wages as a good workman, a rule which prevails at present. With regard to the country money, it is submitted that the term "country" should not apply to the suburban districts. A man who is sent out of Aberdeen even to Cults was under the existing rules able to claim country money, or five shillings extra per week. The masters desire that the additional payment should only take effect when the workmen proceed beyond the suburban area. The Masters' Association have written to the secretary of the Painters' Union intimating their requirements in these matters, but leaving the whole question open for discussion. A meeting of the men will be held on an early date to consider the matter.—*Aberdeen Free Press.*

LEGAL.

IMPORTANT POINT UNDER THE LONDON BUILDING ACT.

THE case of Scott *v.* Carritt came before the Court of Appeal, composed of Lords Justices A. L. Smith, Rigby, and Collins, on the 11th and 12th insts. It was a case stated by Mr. Horace Smith, the Clerkenwell Police Magistrate, on the hearing of an appeal against a notice of objection served by a district surveyor on the appellant, Mr. Wm. Henry Scott, of the "Lord Vernon Arms," Pentonville-road, under Section 150 of the London Building Act, 1894, to the proposed erection by the appellant of certain buildings at Nos. 180 and 182, Pentonville-road, London, beyond the general line of buildings, contrary to Section 22 of the London Building Act, 1894. It appeared that the appellant was the owner of Nos. 180 and 182, Pentonville-road, and, wishing to rebuild the premises, he, on July 5, 1898, applied to the London County Council for their consent to the erection of the buildings to the line of frontage of certain existing buildings one story high which had been erected on the forecourt of the premises. The County Council on August 4, 1898, told the appellant that they refused their consent to the erection of the buildings to the said line of frontage. In September, 1898, the appellant caused plans to be prepared showing the extent of the then existing buildings, and submitted them to the respondent, who certified that they were correct. On the 5th of the month the appellant applied to the Council to sanction the proposed new buildings as deviations from the certified plans under Section 43, Sub-Section 2, of the Act. The

Council, however, in November, declined to consider or give any decision on the application on the ground that the proposed deviations from the certified plans were not such as were contemplated by Section 43, Sub-Section 2, of the Act. On November 30, 1898, the Superintending Architect of the Council certified the general line of buildings in that part of Pentonville-road in which the buildings were situated, and the general line so certified was the main front of the buildings standing back from the forecourts. On January 6, 1899, the appellant served on the respondent notice that he was going to build on the forecourts; and the respondent served a notice of objection to the buildings under Section 150 of the Act, stating that the work would be in contravention of the Act on the ground that it was proposed to erect the buildings without the consent of the Council beyond the general line of buildings contrary to the provisions of Sections 22 and 200 of the Act. The old buildings at Nos. 180 and 182, Pentonville-road, consisted of houses of three stories, with forecourts in front, abutting on Pentonville-road, the houses being built 50 ft. back from the road. The forecourt of No. 180 had been built over and occupied by a public-house of one story since 1858, and the forecourt of No. 182 had been built over and occupied as a shop since 1877. The forecourt in front of No. 182 had been so built over and occupied under licences or consents from the Metropolitan Board of Works dated August 21, 1876; but the forecourt in front of No. 180 had been built over without any consent or licence. There had been no certificate defining the general line of buildings in that part of Pentonville-road prior to the certificate of the Superintending Architect of November 30, 1898. The appellant contended that the intended buildings came within Section 43 of the Act of 1894, and that the Council, upon compliance with that Section, were bound to certify under Sub-Section 2. He further contended that Section 22, Sub-Section 2, applied inasmuch as the land was "lawfully occupied" by buildings within the meaning of that Sub-Section, and that, therefore, the Superintending Architect had no power to certify the building line, and that such certificate afforded no objection in law to the appellant's rights under Section 43. The respondent contended that by the joint effect of an Act passed in the reign of George IV., which prohibited the erection of any building within 50 ft. of the side of the Pentonville-road, and of Section 75 of the Metropolis Management Act, 1862, the land forming the forecourts of the old buildings was not, at the commencement of the Act of 1894, and had not been within seven years previously, "lawfully occupied" by a building within the meaning of Section 22, Sub-Section 2, of the Act; that the building on the forecourt of No. 180 was without any licence or consent, and was, therefore, illegal, and that the building on the forecourt of No. 182 was erected under a consent which was subject to a condition that the building should not be at any time altered or raised without the consent of the Metropolitan Board of Works, and that by Section 216 of the London Building Act of 1894 such condition was still binding on the appellant; and that Section 43 related only to open spaces at the rear of buildings, and had no application to the case. Upon appeal to the magistrate from the objection of the London County Council to the proposed new buildings, the magistrate held that the respondent's contention was well founded, and dismissed the appeal, subject to the present case. The Divisional Court upheld the decision of the magistrate. Hence the present appeal to the Court of Appeal.

At the conclusion of the arguments of counsel Lord Justice Smith, in giving judgment, said that it seemed to him, with regard to the public-house, No. 180, Pentonville-road, the consent of the London County Council was necessary, as in his opinion at the passing of the London Building Act, 1894, the ground was not "lawfully occupied" within the meaning of Sub-Section 2 of Section 22 of the Act of 1894. With regard to No. 182, the erection of the shop on the forecourt did not come within the prohibition in the Act of George IV., because the consent of the Metropolitan Board of Works had been obtained for the building of the shop. The ground was "lawfully occupied" upon a condition, but if the condition were broken it would be unlawfully occupied. Inasmuch as this litigation was instituted for the purpose of ascertaining what were the rights of the parties, in his lordship's opinion, as soon as the appellant commenced to build in contravention of the condition, the County Council could stop him upon the ground that their consent had not been obtained. For those reasons the appellant could not build on either plot without the consent of the County Council.

The other Lords Justices concurred, and the appeal was accordingly dismissed with costs.

Mr. Macmorran, Q.C., and Mr. Germaine appeared for the appellant, and Mr. Horace Avory for the respondent.

DISPUTE AS TO INCOMBUSTIBLE ROOFING MATERIAL.

THE case of the Urban District Council of Hendon *v.* Martin came before a Divisional Court of Queen's Bench, composed of Justices Grantham and Channell, on the 12th inst. on a case stated by the justices of Hendon, the question to be determined being whether a material for roofing consisting of vulcanite covered with soil and ballast was an incombustible material within the meaning of a by-law—following the terms of the London Building Act, 1894—which provided that the roof of any new building should be externally covered with slates, tiles, metal, or other incombustible material. The facts were shortly these:—The respondent was summoned for non-compliance with the by-law, he having used in certain new buildings the material in question. The roofs of the buildings were almost flat, and over the joists boards were laid which were not tongued and grooved so as to fit into each other. On the top of the boards vulcanite about three-eighths of an inch in thickness was laid, and above this were placed 1¾ in. of soil and a similar thickness of burnt ballast. The justices held that even without the covering of soil or ballast the external covering of the roof would be of an incombustible character. But they also held that the soil and ballast being laid on the vulcanite, the roofs were externally covered with incombustible materials, and therefore complied with the by-law, and accordingly refused to convict the respondent.

Mr. Loehnis appeared for the appellants, the Urban District Council; and Mr. McCall, Q.C., and Mr. P. T. Blackwell for the respondent.

Mr. Loehnis contended that the justices were wrong, inasmuch as to comply with the by-law the whole of the material used for covering the roof must be incombustible. He also argued that incombustible material meant something of a similar nature to slates, tiles, or metal, which the material in question was not.

Mr. Justice Grantham, in giving judgment without calling upon counsel for the respondent, held that the justices were right on a question of fact, having found that the roof was externally covered by incombustible materials. One inch of soil and ballast might not have been enough, but in the present case there were three or four inches of admittedly incombustible materials.

Mr. Justice Channell concurred, and the appeal was accordingly dismissed with costs.

RECENT PATENTS:

ABSTRACTS OF PATENTED INVENTIONS.

19,775.—BASINS, SINKS, BATHS, &c.: *R. G. Howson.*—In the crown of the overflow siphon is a hole into which the waste plug is put when it is lifted for the basin's discharge, so that the siphon will act also as a discharge pipe; in a modified shape of the contrivance the lifting of the waste plug automatically closes a cock, for admittance of air, which is fitted upon the siphon.

19,778-9.—GAS BURNERS AND INCANDESCENT LAMPS: *J. Moeller.*—Notches are cut in the rounded jet hole of an atmospherial gas-burner for spreading out the flame and causing it to mix more freely with the air; fragile mantles are guarded from vibration and shock by means of an elastic buffer ring inserted between the gas-pipe and the lamp, the buffer may take the form of either an india-rubber ring having projecting spokes or an inflated rubber-tube.

19,835.—DOOR, GATE, CASEMENT, AND SIMILAR FASTENINGS: *H. Fullwood.*—A rod, which is pivotted on to a bracket of the door frame, is joined to a plate which slides within a guide or bridge-piece upon the door, and is secured to hold the door quite or partly opened by means of a thumb-screw that acts on a pressure-plate. The joint between the plate and the rod consists of a divided link, whose two portions are screwed together, whilst the pivot pins are set at a right-angle to one another, so that the plate will easily adjust itself within the guide.

19,862.—LADDERS: *M. Barth.*—In one shape the contrivance comprises a platform, which is hinged to the ladder at a distance, from its top, of about one-fourth of the ladder's length, and has its free end sustained by the cross-bar of a frame joined with stays, hand-chains, and hinged struts to the ladder, which can be folded by pushing the stays upwards in the middle. In another shape the frame and the ladder are hinged together at the above mentioned distance, and bands or hand chains join the two extensions above the hinge-point together; upon extension of the ladder the halves of the central jointed stays will not move into line, and by pushing the lower extensions of the ladder and frame together the ladder may be folded again.

19,908.—TIPPING-TANK FOR WATER WASTE PREVENTERS: *M. Gautier.*—The service-pipe enters the upper one of the two compartments which together constitute the flushing tank, a tipping-tank being fixed in the lower compartment; at the pressing down of the seat a rod rises to close a valve immediately below the upper compartment, and to open the valve at the foot of the service-pipe, so that the water chamber becomes filled. As the seat again rises the two valves become opened and closed again respectively, and the contents of the water-chamber are thereby discharged into a tank, within the lower compartment, which, tilting over, effects the flush. In a varied arrangement of the same principle a lever of the closed inlet-cock normally retains the tipping-tank in an incline position, but on operation of the pull, the rising lever lifts the tank, whereupon the lever falls to open the inlet-cock, and the consequent filling and tilting of the tank raises the lever again and the inlet is again closed.

19,916.—EDGE-RUNNER MILLS: *E. Chatham.*—Hand-driven gearing is fitted for portable mortar-mills by means of a bevel-wheel upon the pan and an intermediate horizontal shaft; in the case of a fixed pan with revolving runners a bevel wheel at the main shaft's upper end gears with the pinion of an intermediate shaft coupled to the first-motion shaft with chain gearing.

19,920.—PIPE JOINTS: *J. S. & J. S. Clinch.*—The invention relates to sleeve joints which will couple the ends of soft or semi-soft tubes without brazing or soldering. Screwed nuts are first threaded over the pipe-ends, which are then expanded so that they may pass over the inner portions of the couplings; the screwing of the nuts into the couplings grips the pipe-ends and effects the joint.

19,951.—IGNITING GAS WITH ELECTRICITY: *E. Seiler.*—As the supply cock is opened gas flows up the by-pass pipe, the circuit is at the same time completed by means of an arm upon the cock, and the sparks passing between two points ignite the by-pass jet, the two points being so placed on the side of the main burner that the flame shall not injure them; when the supply cock is opened farther the gas flows into the main burner for ignition by the by-pass jet, and when the cock is fully turned on the supply to the by-pass becomes cut off, whilst the arm on the supply cock has been moved far enough to break the circuit; an ebonite block insulates the gas supply-pipe from the burner.

20,005.—MOULDING PIPES: *J. Staley & J. Parker.*—For shaping the tapered and socket end of a sanitary pipe a space intervenes between the cores and the mould, and the clay is impelled through a die-plate into the space; when the table is released the pipe's main body is squeezed through the die and is then cut away, the rabbeted vertical edges of the mould—which consists of two halves hinged on to the table—are pressed towards one another. As the mould rises inside a tapered socket or clamp which is fixed beneath the die, a vertical rod or bolt joins the upper core to the lower core next beneath it, so as to allow a small degree of vertical play to the latter; the rising of the table with the lowest core propels the middle core to fit tightly against the top core, and when the pipe has been removed the halves of the mould are turned outwards, the bottom core being then shifted

20,036.—MOULDING TILES: *A. Weill.*—After the cement has been hammered into the moulding-piece its lip is grooved and bevelled underneath by the movements in opposite directions of the sliding plates, the movements being brought about by an arrangement of pins and levers.

20,078.—JOINTS FOR DRAIN-PIPES: *J. Hopper.*—The tapered flanges of the spigot pass into the socket through breaks made in the flange of the latter, a turn about the axis locks the joint, which is completed with a clay or india-rubber packing ring.

20,115.—ORNAMENTAL WOODWORK: *W. P. Thompson.*—To ensure a higher relief the wood is roughly carved before it is embossed, a cross-grained wood, whose surface may be veneered, being backed with a long-grained wood, and to render it waterproof the glue used for saturating the wood is mixed with formaline; for making brackets a long wood core is laid on each side of the embossed pieces, which are recessed into the backing when panels are required; on the long-grained wood backing is laid a plastic compound of linseed oil, glue, whiting, and resin, or of other cements, covered with veneer or a thin cross-grained wood.

20,118.—TREATMENT OF SEWAGE AND OTHER EFFLUENTS: *R. H. Reeves.*—Waste liquids and effluents from the purification of sewage are caused to flow from collecting-basins through pipes into an under-lying bed of some porous material. The basins, which are set in the surface soil of the land laid out for filtering purposes, are fitted with perforated sides, or their sides may be built up with pipes or porous earthenware. The sediment from the pipes, when mixed with earth, will serve as a fertiliser.

20,168.—A FLUSHING APPARATUS: *C. Armstrong.*—Tipping-tanks of waste-water closets are pivotted by means of a plate which is bolted on to the tank and has three pins and a U-shaped bearing on the tipper box's side, which engages with the middle pin. When the tank is in its normal position the two outer pins are engaged by two projections, and when it tips over, their movement is stopped by two stops; if, as may be, the U-shaped bearing is reversed the pins are affixed to the tipper.

20,180.—WOOD-PLANING MACHINE GUARD: *A. S. Cains & W. H. Grant-Morris.*—A guard for revolving cutters is provided with a set of fingers separately mounted and freely turning upon their axis; counter-balancing extensions of the fingers retain them in place above the cutters when the machine is not at work; the wood presses them backwards when it is advanced over the cutters. In other forms, springs are used instead of balance weights, and a single plate replaces the fingers, or a stop-rod mounted upon radial arms turning upon the axis may

COMPETITIONS, CONTRACTS, AND PUBLIC APPOINTMENTS.

(For some Contracts, &c., still open, but not included in this List, see previous issues.)

COMPETITION.

Nature of Work.	By whom Advertised.	Premiums.	Designs to be delivered
[2]Childrens' Homes	Luton Union	20 Guineas	Feb. 22

CONTRACTS.

Nature of Work or Materials.	By whom Required.	Forms of Tender, &c., Supplied by	Tenders to be delivered
Four Houses and Shop, Lapage-street, Bradford	.....	J. H. Dixon, Architect, 90, Heap-lane, Bradford	Jan. 23
Warehouse, &c., Batley, Yorks.	.....	B. Watson, Architect, Bradford-road, Batley	do.
Cottage, Nine Mile Point (Mon.)	Great Western Railway Co.	G. K. Mills, Paddington Station, W.	do.
School Building Works	Leeds School Board	W. Packer, School Board Offices, Leeds	do.
Waterworks, Doneraile, Ireland	Mallow U.D.C.	B. E. F. Sheahy, Engineer, Council Offices	do.
Refuse Destructor, Acre Moss Field	Morecambe U.D.C.	J. Bond, Surveyor, Council Offices	do.
*Public Lavatories, &c.	Lewisham Board of Works	Surveyor's Department, Lewisham Town Hall, Catford, S.E.	do.
Cottage, Burnside, Duffus, Elgin	.....	Reid & Wittet, Architects, Elgin	Jan. 24
Chapel, Idle Moor, Bradford	.....	Walker & Collinson, Architects, Swan-arcade, Bradford	Jan. 25
Additions to Club House, Bedford	South Beds. Golf Club	J. R. Brown & Son, Architects, Castle-street, Bedford	do.
Additions, The Cliff, Lossiemouth, N.B.	.....	C. C. Doig, Architect, Elgin	Jan. 26
*Additions to Schools at Thornton Heath	Croydon School Board	R. Ridge, School Board Office, Katharine-street, Croydon	Jan. 27
Waterworks, Tolcarne, near Penzance	Madron U.D.C.	F. Latham, Civil Engineer, Penzance	do.
Five Houses, Dale-street, Carlisle	Messrs. T. & J. Bell	Johnstone Bros., Architects, 39, Lowther-street, Carlisle	do.
Seven Cottages, North Elmsall	Hull & Barnsley Railway Co.	The Engineer, 9, Charlotte-street, Hull	do.
Police Station, Stanground, near Peterborough	Standing Joint Committee	E. Borissow, Surveyor, 151, High-street, Huntingdon	do.
Rebuilding Blue Bell Hotel, Wigton	.....	G. Armstrong, Architect, 24, Bank-street, Carlisle	do.
Eighteen Houses, Boreham-road, Wood Green	Mr. R. T. Baker	W. I. Chambers, Architect, Savoy House, W.C.	Jan. 23
Additions to Liddington Hall, Guildford	Mr. H. H. Winton	do.	do.
*Gasholder and Tank	Wokingham Corporation	H. E. Jones, Commercial Gas Co., Stepney	Jan. 29
Alterations to School, Icen Way	Dorchester National School	A. L. T. Tilley, Architect, 26, South-street, Dorchester	do.
*Extension of Electric Light Station	Croydon County Council	Borough Electrical Engineer's Office, Factory-lane, Croydon	do.
Cemetery chapels, &c.	Horsham Burial Committee	C. H. Burstow, Architect, 6, West-street, Horsham	do.
Post Office, &c., Church Street, Ebbw Vale, Mon.	Miss Orchard	James & Morgan, Architects, Cardiff	do.
*Making-up Phœnix-road, Penge	Beckenham U.D.C.	J. A. Angell, Council Offices, Beckenham	do.
*Sewering, Levelling, Paving, &c.	Hornsey U.D.C.	E. J. Lovegrove, Council Offices, Southwood-lane, Highgate. N.	Jan. 30
Chapel, Clifton-street, Swindon	.....	R. J. Beswick, Architect, 9, Regent-street, Swindon	do.
Cast-Iron Pipes, &c.	Chard (Somerset) U.D.C.	G. & F. W. Hodson, Engineers, Loughborough	do.
Water Mains, &c.	Chichester Union Guardians	F. B. Tompkins, Union Offices, Chichester	Jan. 31
*Working-Class Dwellings	Sheffield Corporation	C. F. Wike, Town Hall, Sheffield	do.
*Norway Stone Kerb, &c.	Kingston-on-Thames Corporation	Surveyor, Clattern House, Kingston-on-Thames	do.
Sewerage Works, &c.	Burton-on-Trent Corporation	G. T. Lynam, Borough Engineer, Town Hall	do.
Eight Cottages, Willerby	Hull Corporation	A. E. White, Engineer, Town Hall	do.
Rebuilding Star Hotel, Keighley	.....	Jackson & Fox, Architects, J, Rawson-street, Halifax	do.
Artisans' Dwellings, Townhead-street	Sheffield Corporation	C. F. Wike, Civil Engineer, Town Hall	do.
Alterations, &c., Fountain Inn, St. Mawes, Cornwall	.....	W. Swift, Architect, 38, Lemon-street, Truro	do.
Hospital, Belfast	Victoria Hospital Committee	Henman & Cooper, Architects, Birmingham	Feb. 1
*Broken Granite	Bethnal Green Vestry	F. W. Barratt, Vestry Hall, Church Row, Bethnal Green	do.
*Government Offices, Barrow-in-Furness	H. M. Office of Works	Office of Works, Storey's Gate, S.W.	do.
*Wood Blocks	Paddington Vestry	Surveyor's Office, Vestry Hall, Harrow-road	Feb. 5
*Sand, Shingle, and Cement	do.	do.	do.
*Pitch and Tar	do.	do.	do.
*Laying Underground Conduits and Pipes	The Postmaster-General	C. E. Stuart, General Post Office	do.
*Memorial Hall	Bradford Corporation	J. H. Cox, Town Hall, Bradford	Feb. 6
Water Works, Nettleton	Caistor (Lincs.) R.D.C.	Croft & Bentley, Surveyors, 21, Osborne-street, Grimsby	do.
*Electricity Works	Middleton Corporation	Lacey, Clirehugh, & Sillar, 2, Queen Anne's-gate, S.W.	Feb. 7
Foundations, &c., General Offices, York	North-Eastern Railway Co.	W. Bell, Architect, York	do.
*Electric Lighting Plant, &c.	West Ham Union	Clerk's Office, Union Workhouse, Leytonstone, E.	do.
*General Offices	North-Eastern Railway	W. Bell, Architect, York	do.
*Stables, Cart Sheds, &c.	Camberwell Vestry	Surveyor's Office, Vestry Hall, Camberwell	Feb. 8
*Refuse Destructor	Wood Green U.D.C.	C. J. Gunyon, Town Hall, Wood Green	do.
*Post Office at Rugby	H. M. Office of Works	Office of Works, Storey's Gate, S.W.	Feb. 9
Alterations, &c., Fire Station	Preston Corporation	Borough Surveyor, Town Hall	Feb. 12
Mortuary	Eastbourne Corporation	W. C. Field, Architect, Town Hall	Feb. 13
Electricity Works	Middleton (Lancs.) Corporation	Lacey & Co., 78, King-street, Manchester	Feb. 14
*Alterations and Additions to Schools at Staines	Egham School Board	J. A. Engall, Clarence-street, Staines	Feb. 19
Reservoir, &c., Blackbrook Valley	Loughborough(Leices.)Corporation	G. & F. W. Hodson, Engineers, Loughborough	do.
*Railway Tavern, Mill Hill, Hendon	Messrs. M. A. Sedgwick & Co.	C. P. Ayres, 14A, High-street, Watford	No date
Stabling, Warehouses, &c., Chesterfield	.....	J. P. Earle, Architect, Norfolk-row, Sheffield	do.
Clubroom, Hasland, Chesterfield	.....	do.	do.
Shop, House, &c., Bacup-road, Rawtenstall	.....	G. Oakley, Springside, Rawtenstall	do.
Footbridge, Aireworth	Keighley Corporation	W. H. Hopkinson, Engineer, Town Hall	do.
Shops, Vicar-lane, Leeds	Mr. R. Wray	W. H. Thorp, Architect, 61, Albion-street, Leeds	do.
Church Rooms, Wheatley, Doncaster	.....	Athron & Beck, Architects, Dolphin Chambers, Doncaster	do.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Application to be in
*Clerk of Works	St. Pancras Guardians	3*l.* 3s. per week	Jan. 22
*Clerk of Works	Willesden Guardians	4*l.* 4s. per week	Jan. 23
*Building Inspector and Clerk of Works	Borough of Tynemouth	2*l.* 10s. per week	Jan. 24
*Architectural Assistant	Bournemouth Corporation	.....	Jan. 29
*Building Inspector	Southend-on-Sea Corporation	125*l.* per annum	Feb. 2
*Clerk of Works	County of Southampton	3*l.* per week	Feb. 4
*County Architect	Essex County Council	500*l.* per annum	Feb. 15
*Junior Assistant	Borough of Tynemouth	30s. per week	No date

Those marked with an asterisk (*) are advertised in this Number. *Competition, p.* iv. *Contracts, pp.* iv. vi. viii. x. xii. *&* xxiii. *Public Appointments, pp.* xx. *&* xxiii.

serve to force back all the fingers, some of which can be locked to the rod by locking-levers pivotted on the rod, the locking-levers having shoulders of varying breadths, which engage with projections on the fingers and lock them with the rod according to the angle at which an external lever sets the locking-levers, the latter being joined to the former by arms and links.

20,205.—BY-PASS VALVES: *E. B. Caird and T. J. Rayner.*—The invention applies to by-pass valves whose two valves are coupled upon one spindle for altering the course of the fluid with a single movement of the spindle; of the two valves one is fixed upon the spindle whilst the other is mounted loosely, is pressed in one direction by a spring, and has two seatings, the former valve having one seating. When the spindle is turned until the former valve bears upon its seating the latter valve is also pressed upon its remoter seating, so that the liquid flows directly from the inlet pipe to the outlet pipe without passing through the apparatus attached, because the connexions with the apparatus are thereby closed, but when the former valve remains at rest, away from its seating, and the latter valve, in consequence, bears against its seating less remote, the fluid or liquid passes through the apparatus because the service pipes are then opened, and upon its return, issues at the outlet.

MEETINGS.

FRIDAY, JANUARY 19.

Architectural Association (Discussion Section).—Mr. C. B. Bone on "Granite as a Building Material in the Channel Islands." 7 p.m.

Sanitary Institute (Lectures for Sanitary Officers).—Mr. J. Castell-Evans, F.I.C., on "Mechanical Physics; Laws of Motion, &c." 8 p.m.

Institution of Civil Engineers.—Students' visit to the Hydraulic Installation at Somers Town Goods Depôt, and to the Kentish Town Locomotive Sheds of the Midland Railway, where a new American goods engine will be inspected, 2 p.m.

SATURDAY, JANUARY 20.

People's Palace Architectural Society.—Mr. Tanner on "History of House Drainage." 7.30 p.m.

British Institute of Certified Carpenters. — Visit to the English Education Exhibition, Imperial Institute. 2 p.m.

MONDAY, JANUARY 22.

Royal Institute of British Architects.—(1) To read the Deed of Award of Prizes and Studentships for 1899-1900, in accordance with By-law 66; (2) Mr. Basil Champneys, B.A., on "The John Rylands Memoral Library, Manchester."—Illustrated by lantern slides. 8 p.m.

Society of Arts (Cantor Lectures).—Mr. Bennett H. Brough on "The Nature and Yield of Metalliferous Deposits."—I. 8 p.m.

Liverpool Architectural Society. — Second members' meeting. Mr. M. Honan on "Doors and Doorways." 6 p.m.

Leeds and Yorkshire Architectural Society.—Biennial dinner.

TUESDAY, JANUARY 23.

Institution of Civil Engineers.—Mr. J. A. Saner on "Swing-Bridges over the River Weaver at Northwich." 8 p.m.

Architectural Association of Ireland.– Sir C. Cameron on "Sanitation in regard to Tenement Houses." 8 p.m.

WEDNESDAY, JANUARY 24.

Society of Arts.—Mr. W. O. E. Meade-King on "Local Government and its Relation to Parish Water Supply and Sewerage." 8 p.m.

Sanitary Institute (Lectures for Sanitary Officers).—Mr. John Castell-Evans, F.I.C., on "Natural Forces; Light, Heat, Electricity." 8 p.m.

THURSDAY, JANUARY 25.

Institution of Electrical Engineers.—(1) Adjourned discussion on the Report of the Institution's Visit to Switzerland; and (2, if time permit) Mr. Sherard Cowper-Coles on "An Electrolytic Centrifugal Process for the Production of Copper Tubes." 8 p.m.

FRIDAY, JANUARY 26.

Architectural Association.—Mr. W. R. Lethaby on "Cast Iron." 7.30 p.m.

Institution of Mechanical Engineers. — Fifty-third annual general meeting. Mr. W. Schönheyder on "Water Meters of the Present Day; with Special Reference to Small Flows and Waste in Dribbles." 8 p.m.

Sanitary Institute (Lectures for Sanitary Officers).—Mr. John Castel'-Evans, F.I.C., on "The Atmosphere; Pressure and Composition." 8 p.m.

Institution of Civil Engineers (Students' Meeting).—Mr. C. B. Fox on "The Simplon Tunnel." 8 p.m.

Glasgow and West of Scotland Technical College (Architectural Craftsmen's Society).—Mr. D. Skinner on "Builders' Lifting Appliances." 8 p.m.

SATURDAY, JANUARY 27.

Institution of Junior Engineers.—Fifteenth Anniversary Dinner, at the Westminster Palace Hotel, the President, the Hon. Charles A. Parsons, F.R.S., in the chair. 6.30 p.m.

People's Palace Architectural Society.—Visit to the new railway, Mile End-road. 2.30 p.m.

Dundee Institute of Architecture.—Mr. R. S. Douglas on "Greek and Gothic Abstraction from Natural Forms: a Comparison." With limelight illustrations. 7.30 p.m.

SOME RECENT SALES OF PROPERTY:

ESTATE EXCHANGE REPORT.

January 9.—By HARDS & BRADLY (On the Premises).

Greenwich.—112, Woolwich-rd., u.t. 70 yrs., g.r. 4*l.* 4s. £340

By J. & S. MOTION (at Mason's Hall Tavern).

Strand.—"The George Hotel," u.t. 36, 25, and 16 yrs., r. 570*l.*, with goodwill 25,000

January 10.—By DOUGLAS YOUNG & CO.

Brixton.—Cumberland-place, Harley Cottage, u.t. 83 yrs., g.r. 10*l.*, r. 31*l.* 380

Clapham.—81, Sandmere-rd., u.t. 81 yrs., g.r. 7*l.*, r. 36*l.* 420

Ilford, Essex.—Balfour-rd., Kilmarnock Lodge and Gourick House, u.t. 96½ yrs., g.r. 12*l.* 12s., e.r. 72*l.* 600

PRICES CURRENT OF MATERIALS:

WOOD.*

Per Petersburg standard hundred.

	£	s.	d.	£	s.	d.
White Sea: first yellow deals	18	0	0	21	10	0
Second do.	16	0	0	18	0	0
Third do.	13	10	0	15	0	0
Battens, 40s., 30s., and 15s. less respectively.						
Petersburg: first yellow deals	15	0	0	17	10	0
Second do.	12	0	0	13	10	0
Battens, 30s. and 20s. less respectively.						
Petersburg, white deals	10	10	0	12	10	0
Do. white battens	9	0	0	10	0	0
Riga, white deals	9	10	0	10	10	0
Swedish mixed yellow deals	16	0	0	18	0	0
Third do.	14	0	0	16	0	0
Fourth do.	12	0	0	13	0	0
Fifth do.	11	0	0	12	0	0
Battens, 30s., 20s., and 10s. less respectively.						
Whitewood, 10 to 20 per cent. less.						
Finnish unsorted yellow deals	11	0	0	11	10	0
Battens, 10s. and 5s. less respectively.						
Whitewood, 5 to 10 per cent. less.						
Norwegian second yellow battens	8	0	0	8	10	0
Third do.	7	15	0	8	0	0
Fourth do.	7	10	0	7	15	0
Whitewood, 10s. less.						
Danzig, Crown Deck deals, per 40 ft. 3 in.	0	15	0	1	5	0
Brack	0	12	0	1	0	0

* The prices named are for the wood as imported and landed in the docks. Ten per cent., approximately, should be added in order to arrive at the current trade prices.

PRICES CURRENT—*continued.*

	£	s.	d.	£	s.	d.
St. Lawrence Pine deals, &c., per P.S.H.:—						
1st, Bright and Dry, regular sizes	20	0	0	27	0	0
" " oddments	13	0	0	20	0	0
2nd " regular sizes	15	0	0	17	10	0
" " oddments	10	0	0	14	0	0
3rd " regular sizes	9	0	0	11	0	0
" " oddments	7	10	0	9	10	0
4th " regular sizes	8	0	0	9	0	0
" " oddments	7	0	0	8	10	0
St. Lawrence Spruce deals, &c.						
First, regular sizes	9	10	0	12	10	0
Second "	9	0	0	9	10	0
Third "	8	15	0	9	0	0
Fourth "	8	0	0	8	10	0
Oddments and battens at 20s., 10s., 7s. 6d., and 5s. less respectively.						
New Brunswick Spruce deals, &c.	8	10	0	9	0	0
Oddments, battens, and fourths	8	0	0	8	10	0
United States pitch pine planks and boards	10	0	0	13	0	0
Prepared Boards, per square						
1¼ by 6½ and 7 in. 1st yellow		10	0		15	0
" " 2nd "		9	6		12	0
1 by 6½ and 7 in. 1st "		9	6		11	0
" " " white		8	0		9	6
" " 2nd yellow		8	0		10	0
" " " white		7	0		8	0
¾ by 6½ & 7 in. 1st & 2nd yellow		7	9		9	0
" " " white		7	6		8	6
¾ by 6½ and 7 in. 1st yellow and white (grooved, tongued, and beaded)		8	0		9	6
¾ by 6½ and 7 in. 2nd yellow and white (ditto)		7	6		8	6
⅝ by 6½ and 7 in. 1st yellow and white (ditto)					7	6
⅝ by 6½ and 7 in. 2nd yellow and white (ditto)		6	0		7	0
Narrower widths at 10 per cent. less. 3rd quality at 15 per cent. less than 2nd.						
Danzig and Memel Fir Timber— per load						
Best middling	3	15	0	4	0	0
Good middling and Second	3	5	0	3	10	0
Common middling	3	0	0	3	5	0
Undersized	3	0	0	3	5	0
Swedish and Norwegian Balks	2	10	0	2	15	0
Baltic Oak Timber—						
Danzig and Stettin—Large	3	5	0	4	5	0
Small	2	10	0	3	5	0
Quebec Timber per load						
Yellow Pine	4	15	0	6	5	0
Oak	4	12	6	6	15	0
Elm	4	2	6	4	7	6
Ash	3	7	6	4	2	6
Birch	3	7	6	5	15	0
New Brunswick, &c., Birch	3	2	6	3	12	6
American Pitch Pine Timber	3	17	6	4	10	0
Wainscot, per log, 18 cubic ft.—						
Crown (Eng. & Dutch) } nominal	3	7	6	4	10	0
Brack } nominal	2	12	6	3	12	6
Lathwood, per cubic fathom—						
Petersburg	4	0	0	6	10	0
Riga and Danzig	4	10	0	5	10	0
Norway Poles, per ft. run	0	0	1	0	0	1½
Oak Staves, per mille full size pipe						
Memel, Crown	220	0	0	230	0	0
Brack	190	0	0	200	0	0
Danzig	165	0	0	175	0	0
Bosnia, single Barrel (nominal)	28	0	0	30	0	0
United States, Pipe	37	10	0	45	0	0
Hogshead, extra heavy and double extra	30	0	0	35	0	0
Indian Teake per load	11	10	0	17	0	0
British Guiana Greenheart	0	0	0	8	0	0
Mahogany, per foot superficial—						
Honduras, cargo average	0	0	5	0	0	6½
Nicaragua, do.	0	0	4½	0	0	5½
Tabasco, do.	0	0	4½	0	0	6½
Mexican, do.	0	0	4	0	0	4½
Panama, do.	0	0	3	0	0	4
African, do.	0	0	3½	0	0	5½
Cuba, do.	0	0	6	0	0	8
St. Domingo, do.	0	0	5	0	0	7½
Do. Curls (good to prime)	0	0	9	0	1	3
Walnut, American (logs)	0	2	3	0	4	6
Do. do. (planks and boards)	0	2	0	0	7	6
Italian, per foot superficial	0	0	3	0	0	7½
Black Sea, per ton	6	0	0	12	0	0
Satin Walnut (logs) per foot cube	0	1	0	0	1	3
" (planks and boards)	0	2	0	0	2	9
Sequoia (Californian redwood), per foot cube	0	1	9	0	2	0
Whitewood, American (logs)	0	1	3	0	1	6
" " (planks and boards)	0	1	6	0	2	9
Quartered oak " "	0	2	3	0	4	0
Kauri pine (logs)	0	1	9	0	2	0
" " (planks)	0	2	3	0	2	9
Jarrah (planks)	0	2	0	0	2	3
Lancewood spars each, fresh and large	0	5	0	0	8	0
Lancewood spars, ordinary to fair	0	4	0	0	5	0
Degame spars	0	8	0	0	10	0

METALS.

IRON—Pig, in Scotland ton	3	8	1½	0	0	0
Bar, Welsh, in London	9	0	0	9	15	0
Do. do. at works in Wales	8	10	0	9	0	0
Do. Staffordshire, in London	9	15	0	11	15	0
COPPER—British cake and ingot	76	0	0	77	0	0
Best selected	77	0	0	78	0	0
Sheets, strong	80	0	0	82	0	0
Chili bars	70	12	6	0	0	0
YELLOW METAL lb.		6½d.			7d.	
LEAD—Pig						
Spanish ton	16	15	0	0	0	0
English Com. Brands	17	0	0	0	0	0
Sheet, English, 6 lbs. per sq. ft. and upwards	18	0	0	0	0	0
Pipe	18	10	0	0	0	0
ZINC—English sheet ton	24	0	0	0	0	0
Vieille Montagne	26	0	0	0	0	0
Spelter	20	10	0	0	0	0
TIN—Straits	117	15	0	0	0	0
Australian	118	0	0	118	10	0
English Ingots	122	0	0	123	0	0
Banca	0	0	0	0	0	0
Billiton	0	0	0	0	0	0

PRICES CURRENT—*continued.*

OILS.

	£	s.	d.	£	s.	d.
Linseed ton	23	12	6	0	0	0
Cocoanut, Cochin	29	15	0	0	0	0
Do. Ceylon	26	15	0	0	0	0
Palm, Lagos	27	10	0	0	0	0
Rapeseed, English, pale	24	15	0	0	0	0
Do. Brown	23	5	0	0	0	0
Cottonseed ref.	19	10	0	20	0	0
Oleine	17	5	0	19	5	0
Lubricating U.S.	0	8	0	0	0	0
Do. Black	0	7	6	0	0	0
TAR—Stockholm barrel	1	6	6	0	0	0
Archangel	1	0	0	0	0	
Turpentine	38	12	6	38	15	0

BRICKS, &c.

	s.	d.		
Hard Stocks	36	6	per thousand alongside, in river.	
Rough Stocks	32	6	"	"
Grizzles	32	6	"	"
Smooth Bright Facing Stocks	62	0	"	"
Fletton	31	6	"	at railway depôt.
Red Wire Cuts	34	0	"	"
Best Fareham Red	71	6	"	"
Best Blue Pressed Staffordshire	86	0	"	"
Best Stourbridge Fire Bricks	84	0	"	"
Best White Glazed Bricks—Headers and Stretchers	240	0	"	"
Best Dipped Salt Glazed—Headers and Stretchers	220	0	"	"
Seconds Quality White and Salt Glazed	40	0	per thousand less than best.	

	s.	d.	
Thames and Pit Sand	7	0	per yard, delivered.
Thames Ballast	6	0	" "
Best Heavy Portland Cement	36	0	per ton "
Best Ground Blue Lias Lime	23	0	" "

NOTE.—The cement and lime is exclusive of the ordinary charge for sacks.

Grey Stone Lime ..... 12s. 6d. per yard, delivered.

STONE.

	s.	d.		
Ancaster in blocks	2	0	per ft. cube, deld. rly. depôt	
Beer "	1	7	"	"
Grinshill "	1	10	"	"
Red Gorsehill in blocks	2	5	"	"
Red Mansfield "	2		"	"
Hard York "	2	1		

TILES, SLATES.

	s.	d.	
Best plain red roofing tiles	40	6	per 1,000 at rly. depôt.
hip and valley tiles	3	6	per doz. " "
Best Broseley tiles	46	6	per 1,000 " "
hip and valley tiles	3	8	per doz. " "

in. in.	£	s.	d.	
20×10 best blue Bangor	11	5	0	per 1000 of 1200 at ry. dep
16× 8 " "	6	2	6	" "
20×10 best unfading green	11	0	0	" "
16× 8 " "	6	12	0	" "

TO CORRESPONDENTS.

"Architect" (We can pay no attention to communications not accompanied by name of sender).

NOTE.—The responsibility of signed articles, letters, and papers read at meetings, rests, of course, with the authors.

We cannot undertake to return rejected communications.

Letters or communications (beyond mere news items) which have been duplicated for other journals are NOT DESIRED.

We are compelled to decline pointing out books and giving addresses.

Any commission to a contributor to write an article is given subject to the approval of the article, when written, by the Editor, who retains the right to reject it if unsatisfactory. The receipt by the author of a proof of an article in type does not necessarily imply its acceptance.

All communications regarding literary and artistic matters should be addressed to THE EDITOR; those relating to advertisements and other exclusively business matters should be addressed to THE PUBLISHER, and *not* to the Editor.

TENDERS.

[Communications for insertion under this heading should be addressed to "The Editor," and must reach us *not later than 10 a.m. on Thursdays.* N.B.—We cannot publish Tenders unless authenticated either by the architect or the building-owner; and we cannot publish announcements of Tenders accepted unless the amount of the Tender is given, nor any list in which the lowest Tender is under £100, unless in some exceptional cases and for special reasons.]

* Denotes *accepted.* † Denotes *provisionally accepted.*

CRADLEY.—For the erection of Baptist Church. Mr A. T. Butler, architect, Cradley Heath. Quantities, the architect:—

		Allowance for old materials.
C. A. Horton	£4,044 0 0	—
John Dallow	3,974 0 0	£45 0 0
A. & S. T. Bishop	3,957 0 0	—
Roberts & Son	3,940 0 0	50 0 0
Brooks & Tandy	3,735 0 0	—
C. Griffiths	3,710 0 0	40 0 0
W. Willetts	3,543 0 0	—
J. M. Tate	3,600 0 0	150 0 0
J. A. Meredith	3,599 2 7	150 0 0
H. Dorse, Cradley Heath*	3,250 0 0	70 0 0

[*See also next page.*

CROYDON.—For alterations and additions to the Board schools, Beulah-road, Thornton Heath, for the Croydon School Board. Mr. Robert Ridge, architect, Katharine-street, Croydon. Quantities by Mr. Mansfield Price, Sutton, Surrey :—

J. & C. Bowyer	£899	H. Bacon	£713
Smith & Sons	748	Bulled & Co.‡	699
W. & C. Akers	735		

[All of Croydon.]

‡ Recommended for acceptance subject to the approval of the Education Department.

FELIXSTOWE.—For the erection of a pair of semi-detached houses in Bath-road, for Mrs. Dreaper. Mr. Henry W. Buxton, architect, Lorne-buildings, Felixstowe :—

Thurman	£1,897 0 0	Ward	£1,793 0 0
Linzell	1,850 0 0	Pratt*	1,598 18 6

[All of Felixstowe.]

FELIXSTOWE.—For the erection of a pair of semi-detached houses in Beach-road, for Mr. A. W. Franklin. Mr. Henry W. Buxton, architect, Lorne-buildings, Felixstowe. Quantities by the architect :—

Thurman	£2,643	Linzell	£2,355
Banyard	2,500	Ward	2,340
Hipwell	2,395	Pratt	2,301
West	2,394		

LONDON.—For seating, &c., for two chapels at the workhouse, King's-road, St. Pancras, for the Guardians of the Poor of the Parish of St. Pancras. Messrs. A. & C. Harston, architects, 15, Leadenhall-street, E.C. :—

Benham & Froud	£757 10	North of England School Furnishing Company	£394 0
Sims & Wodds	737 0	Hammer & Co.	345 0
Spencer Santo & Co., Ltd.	520 0	Wake & Dean	336 0
Jones & Willis	459 0	Parkers' Joinery and Cabinet Co., Ltd.*	318 10
Lonnie & Co.	435 0		

LONDON.—For sanitary and other works at 20, Carlton-road, Putney, for Mr. A. G. Theed. Mr. Walter J. Ebbetts, architect and surveyor, Savoy House, 115, Strand, W.C. :—

Wm. Holley* £300

LONDON.—For decorative and sanitary repairs at 21 and 23, Lee Park, Blackheath, S.E., for Mr. E. E. McColm. Mr. Alfred Roberts, architect, 18, Nelson-street, Greenwich, S.E. :—

Jones & Groves	£395	W. Martin	£359
W. Mills	389	Couchman & Co.*	289

LONDON.—For building works at the Grove Hospital, for the Metropolitan Asylums Board :—

J. Carmichael	£663 10 0	Chas. Wall, Lots-road, Chelsea*	£564 9 0
Johnson & Co. Ltd.	584 4 11		

[Surveyor's approximate estimate, £390 10s.]

RUSTINGTON. — For sea defence works on the Metropolitan Asylums Board's property at Rustington. Mr. H. Howard, surveyor, Littlehampton :—

Alfred Crouch	£470 0	George Olliver, 38, River-rd., Littlehampton*	£365 0
William Swales	431 15		
Snewin Bros.	415 0		

[Surveyor's approximate estimate, £400.]

SANDOWN. — For the erection of a higher grade Board school, for the Brading School Board. Mr. James Newman, architect, Sandown :—

Brown & Corney	£8,435	J. White	£6,295
E. James	7,180	Ball & Son‡	6,180
H. Linington	6,677	E. Hayden§	5,717

‡ Amended tender of £5,960 accepted. § Withdrawn.

SANDOWN.—For the erection of a villa residence, Victoria-road, for Mr. G. T. Woods. Mr. James Newman, architect, Sandown :—

W. Jolliffe	£1,150	Ball & Son*	£894
H. Attrill	945		

SANDOWN.—For the erection of additional school buildings at the National school. Mr. James Newman, architect, Sandown :—

Ball & Son	£918 0	Brown & Corney	£834 10
W. Jolliffe	880 0	H. Attrill*	796 0

SANDOWN.—For the erection of a pair of houses, Pell-street, for Mr. Harvey Child. Mr. James Newman, architect, Sandown :—

Brown & Corney* £925

SANDOWN.—For the erection of a villa, Winchester-road, for Mr. J. Mew. Mr. James Newman, architect, Sandown :—

H. Attrill* £735

SANDOWN.—For the erection of four pairs of cottages, Hill-street, for Mr. G. W. Rendel. Mr. James Newman, architect, Sandown :—

F. Quinton	£2,880	R. Buckett	£2,492
J. Meader, jun.	2,752	Ball & Son*	2,440
H. Attrill	2,515		

WHITLEY (Northumberland). — For the erection of Council offices, fire station, &c., for the Urban District Council. Mr. J. P. Spencer, C.E., 13, Grainger-street West, Newcastle-on-Tyne :—

J. L. Miller	£3,976 14 8	G. Robson	£3,252 0 0
J. H. Greenwell	3,780 0 0	Jas. Douglass, Cullercoats*	3,168 2 6
J. & W. Simpson	3,775 0 0	R. Dryden	3,160 17 0
Davison & Bolam	3,505 18 0	Smelt & Co.	3,150 0 0
N. Ritchie	3,300 0 0		

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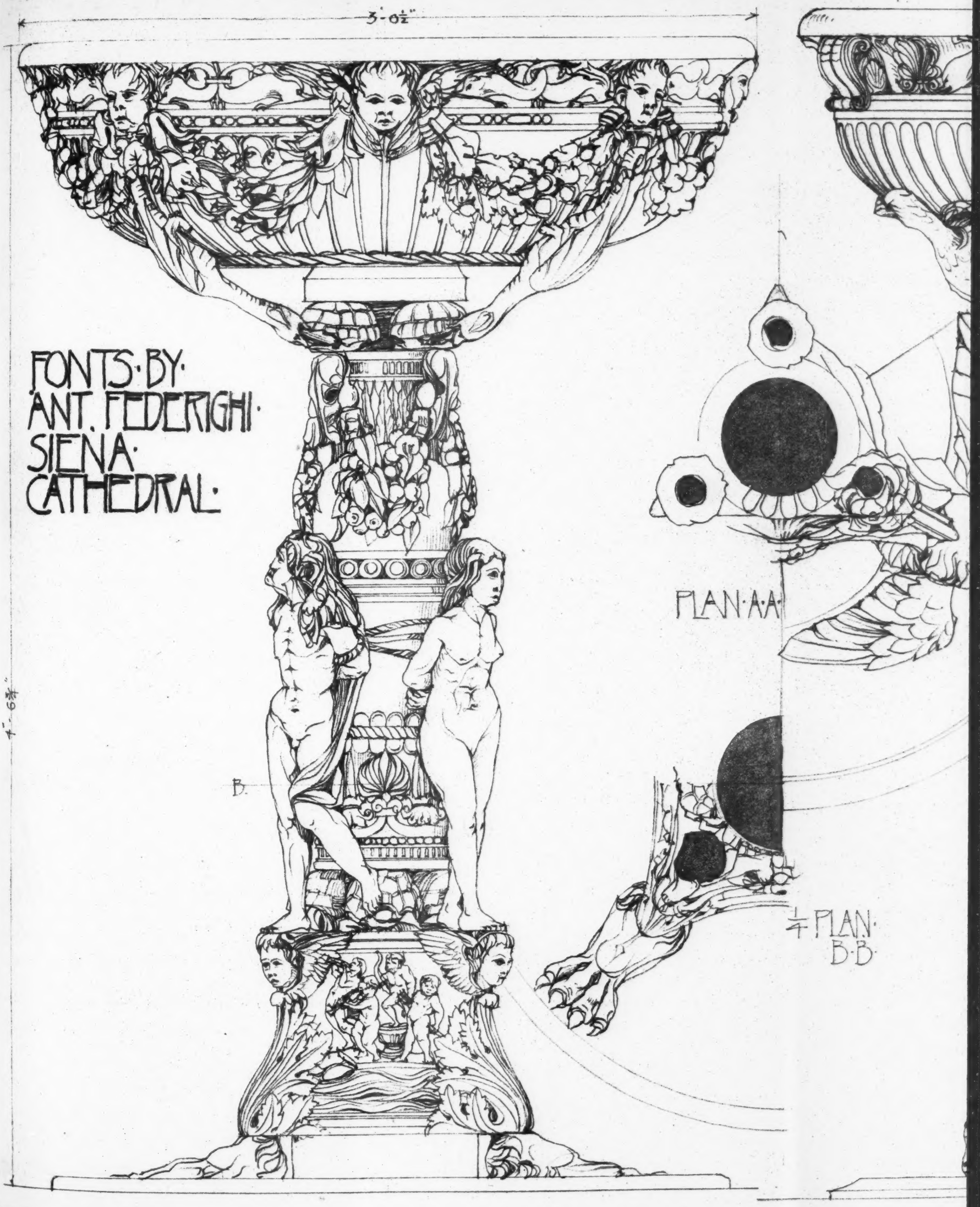

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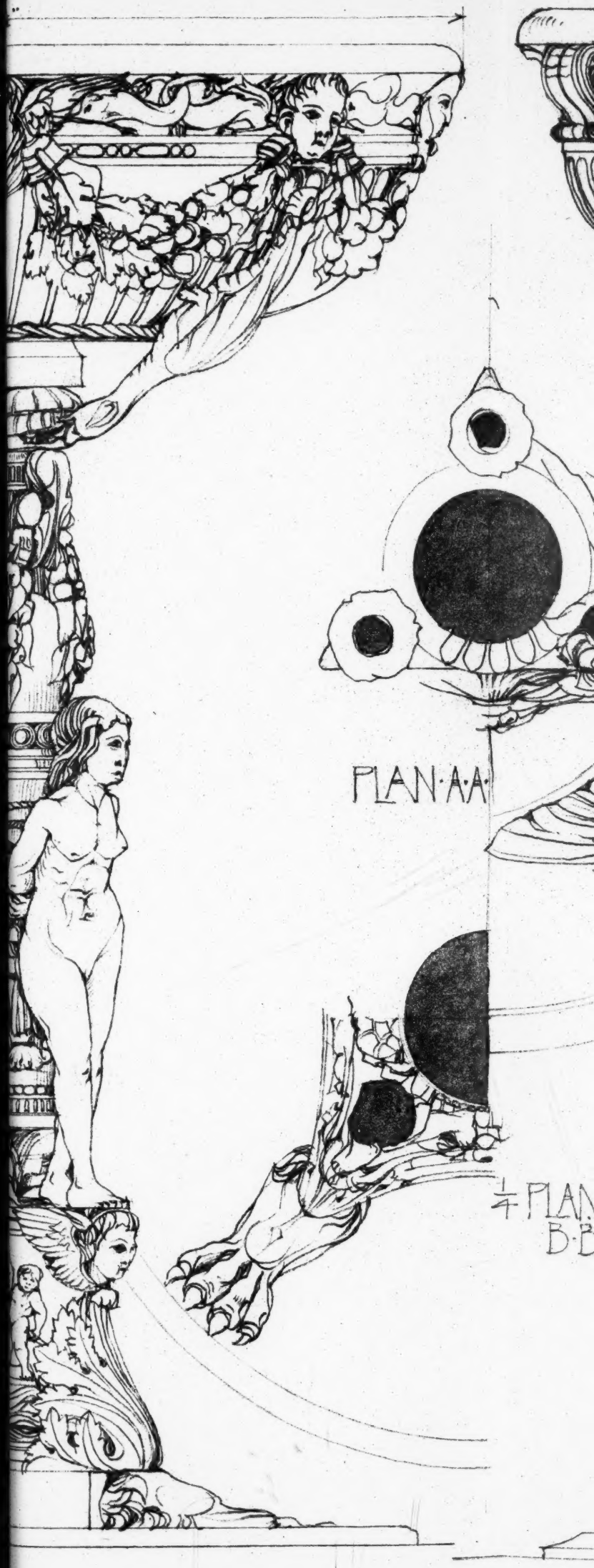

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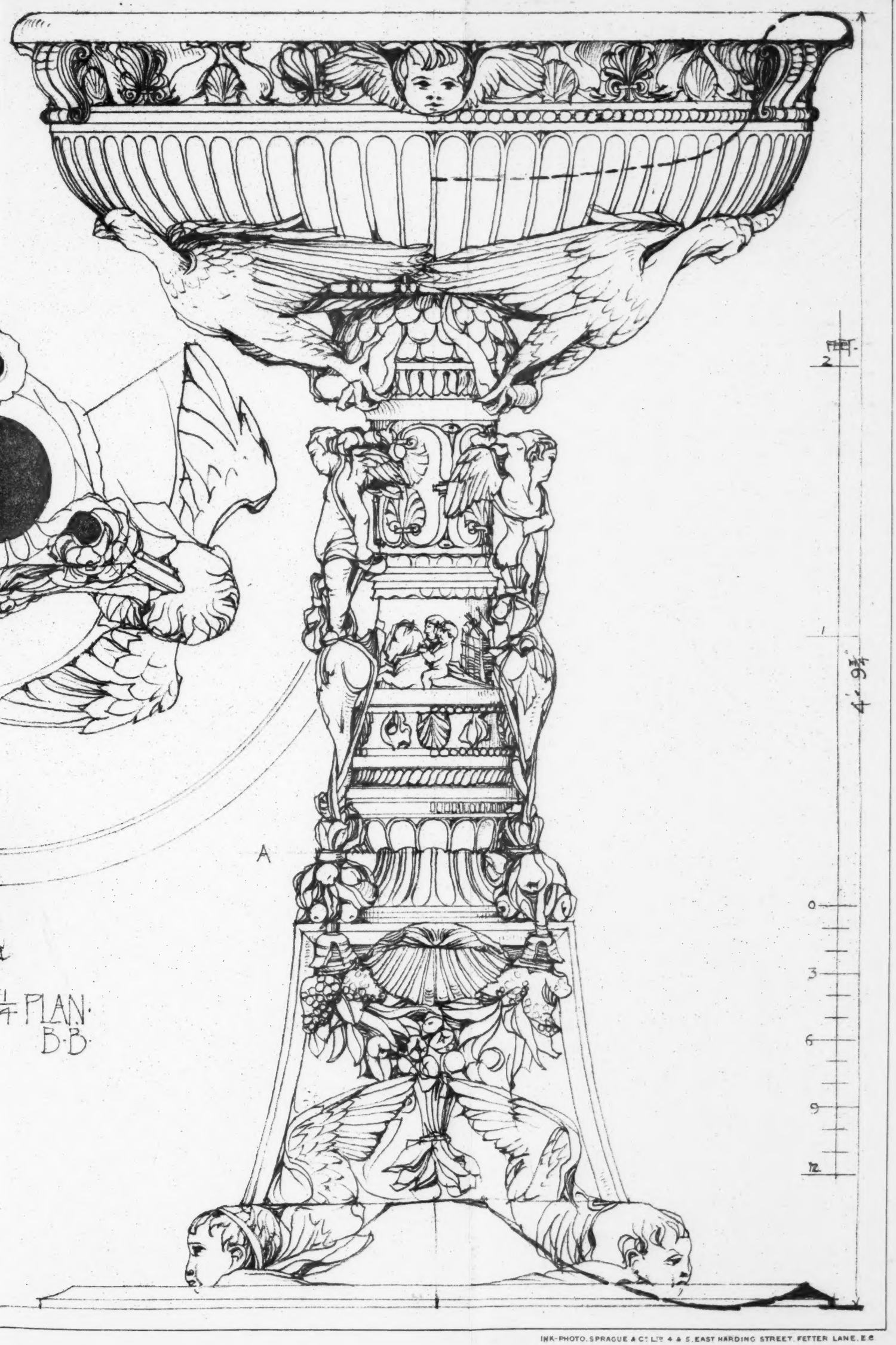

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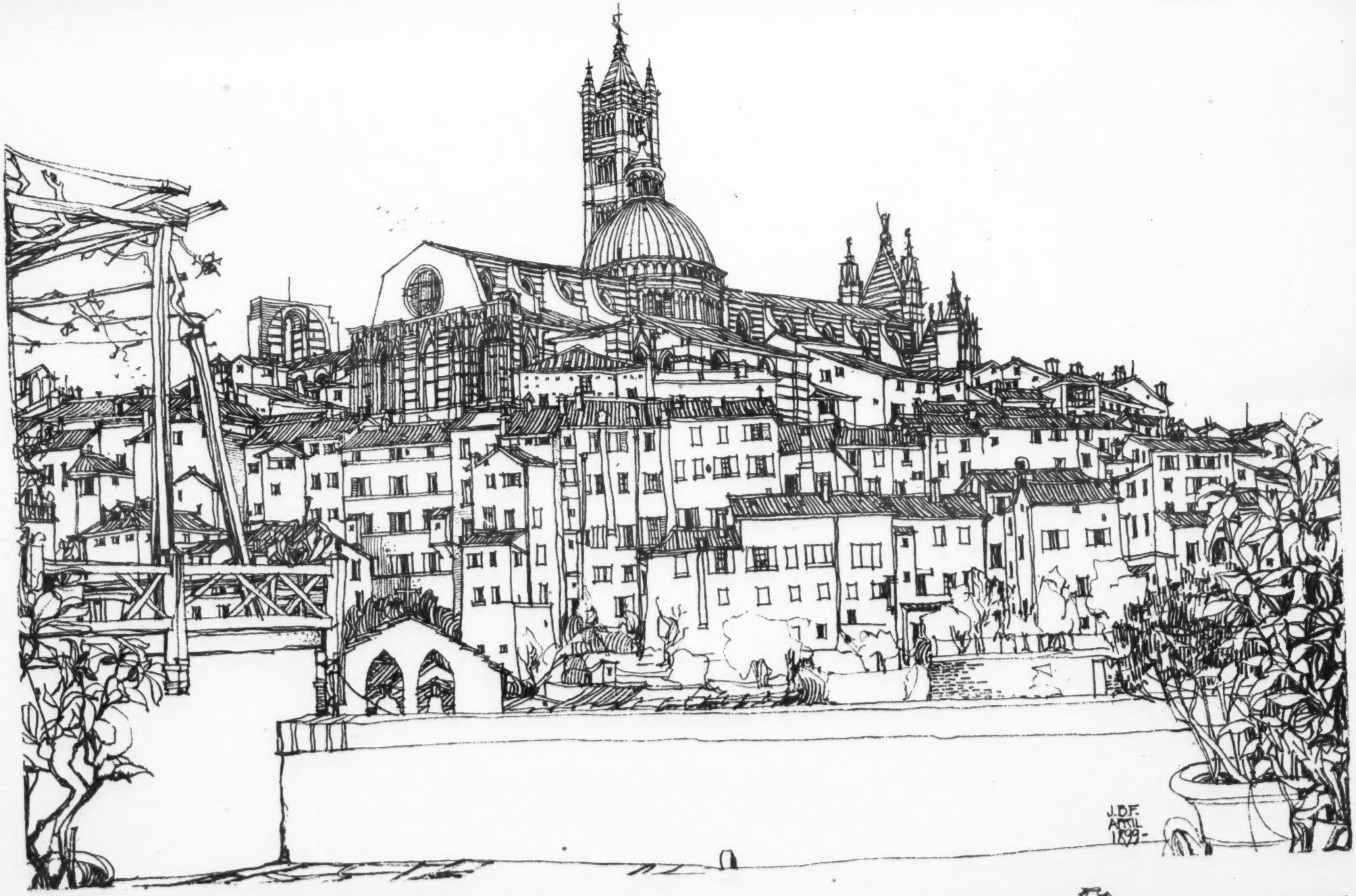

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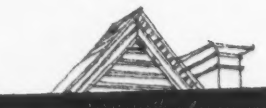

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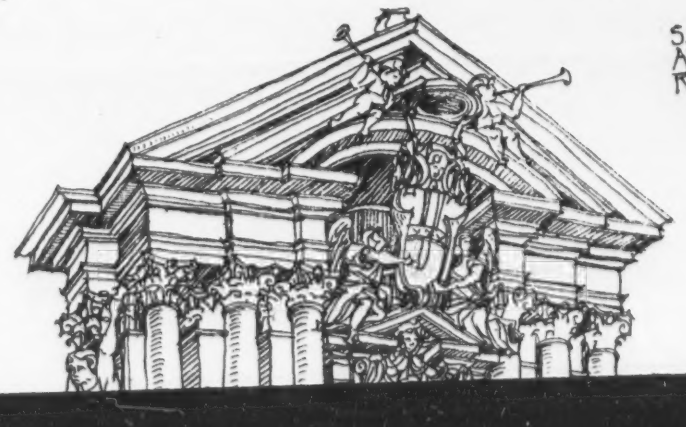

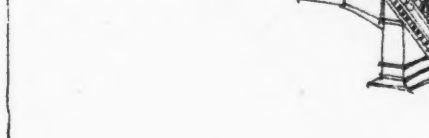

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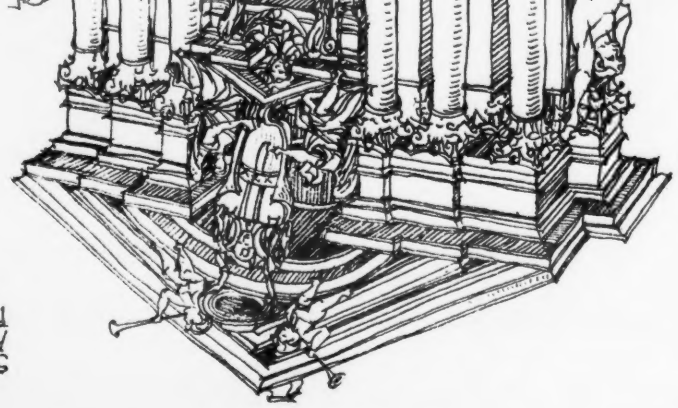

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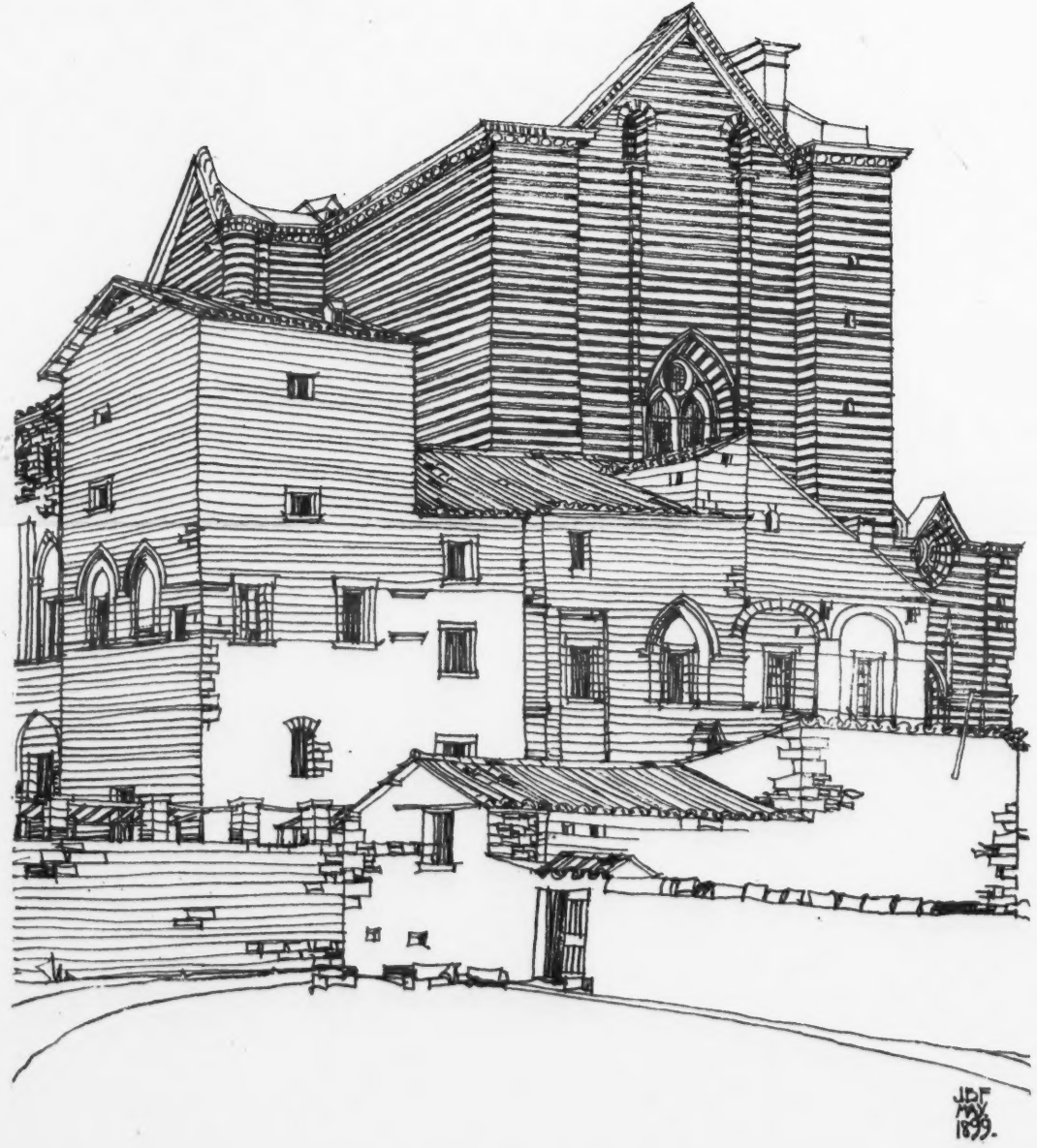

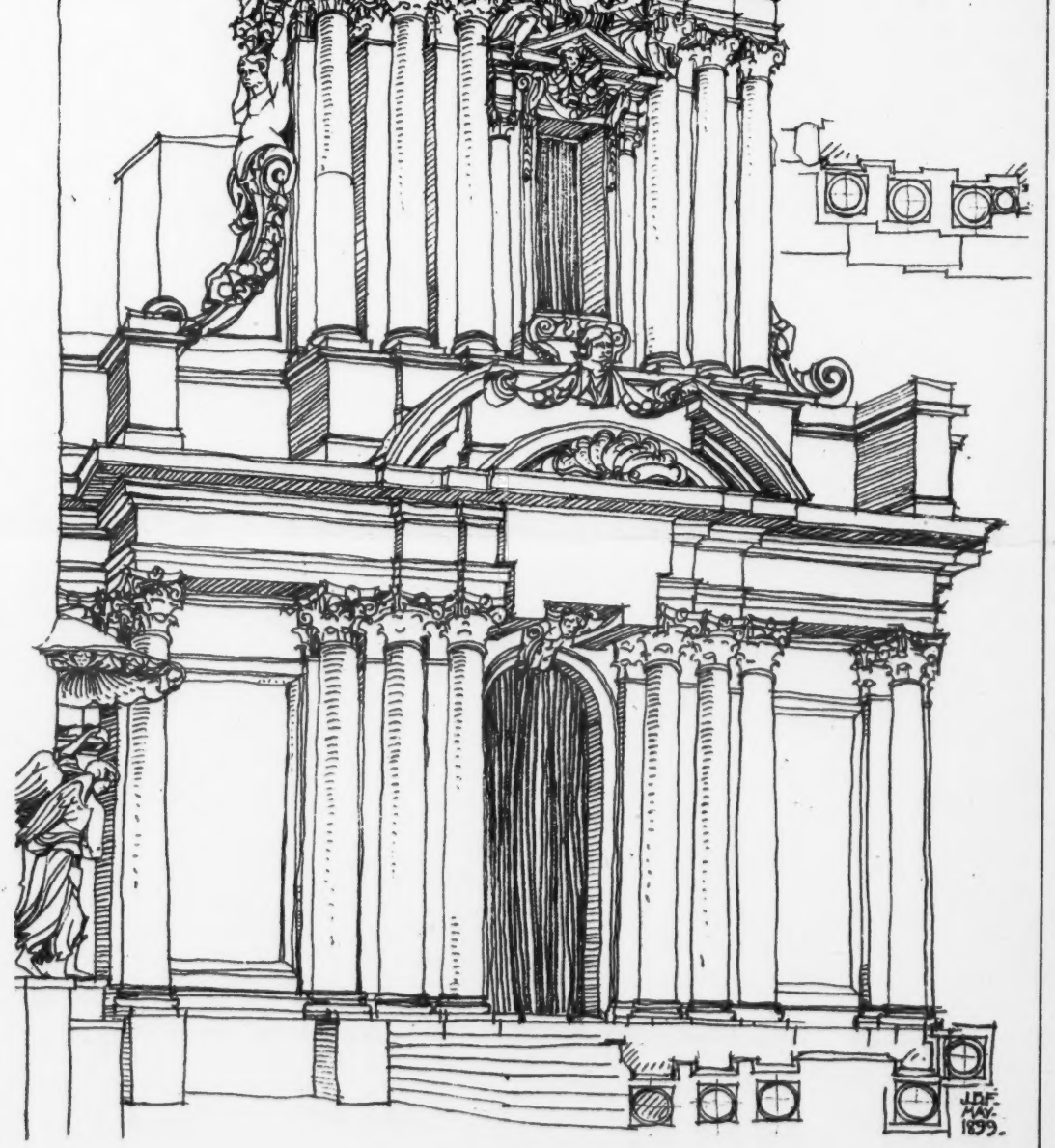

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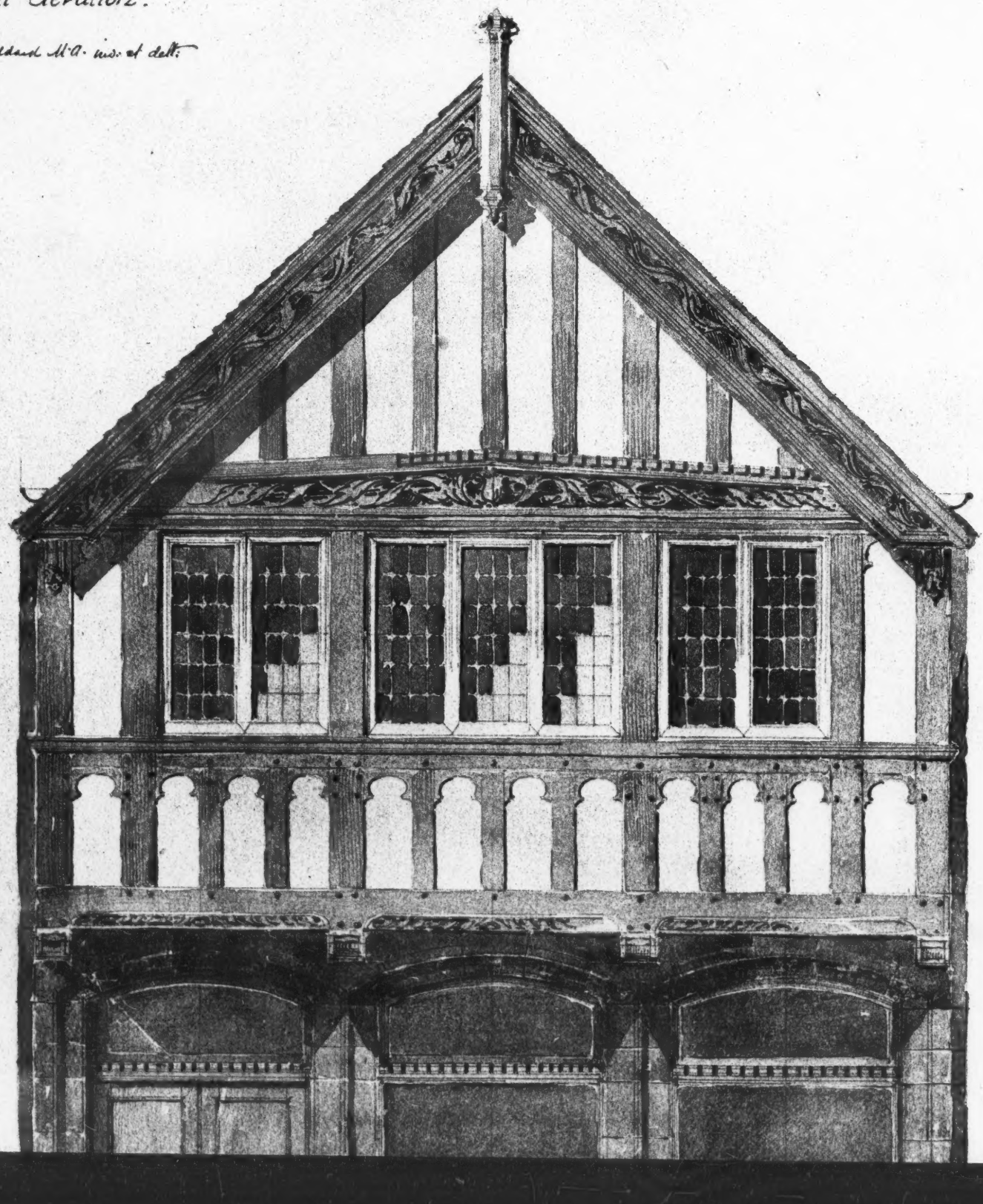

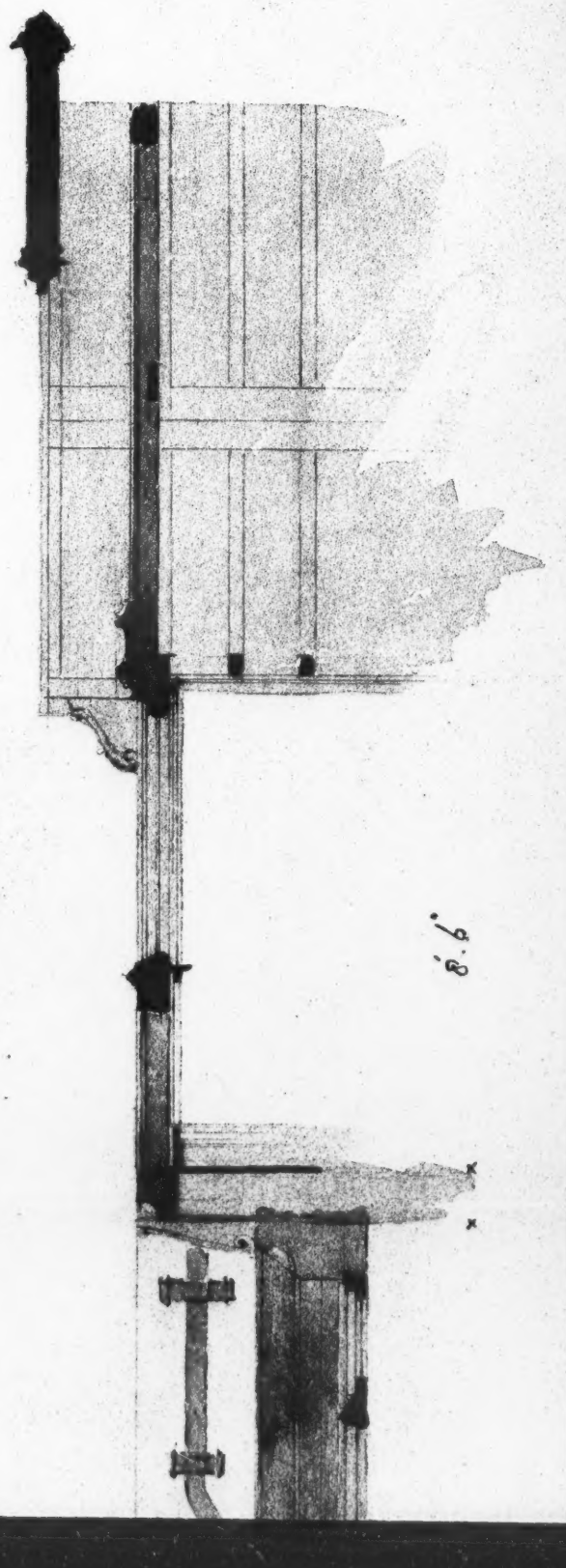

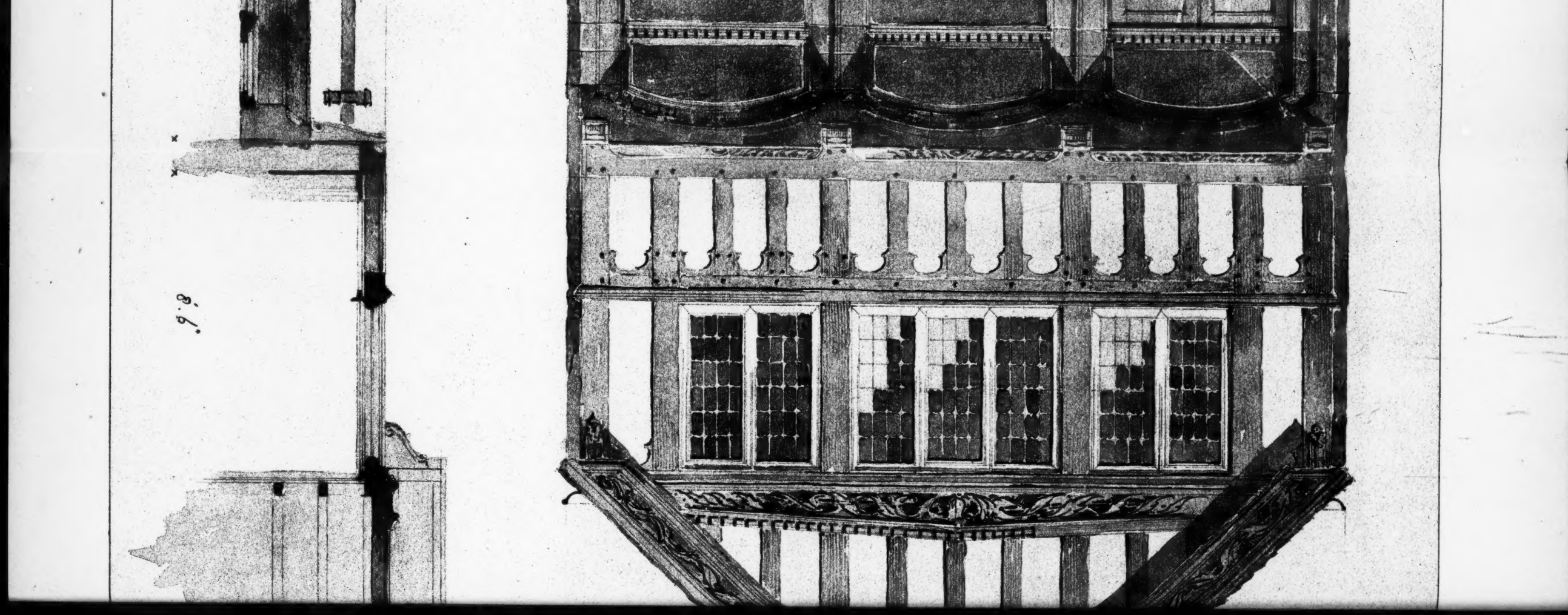

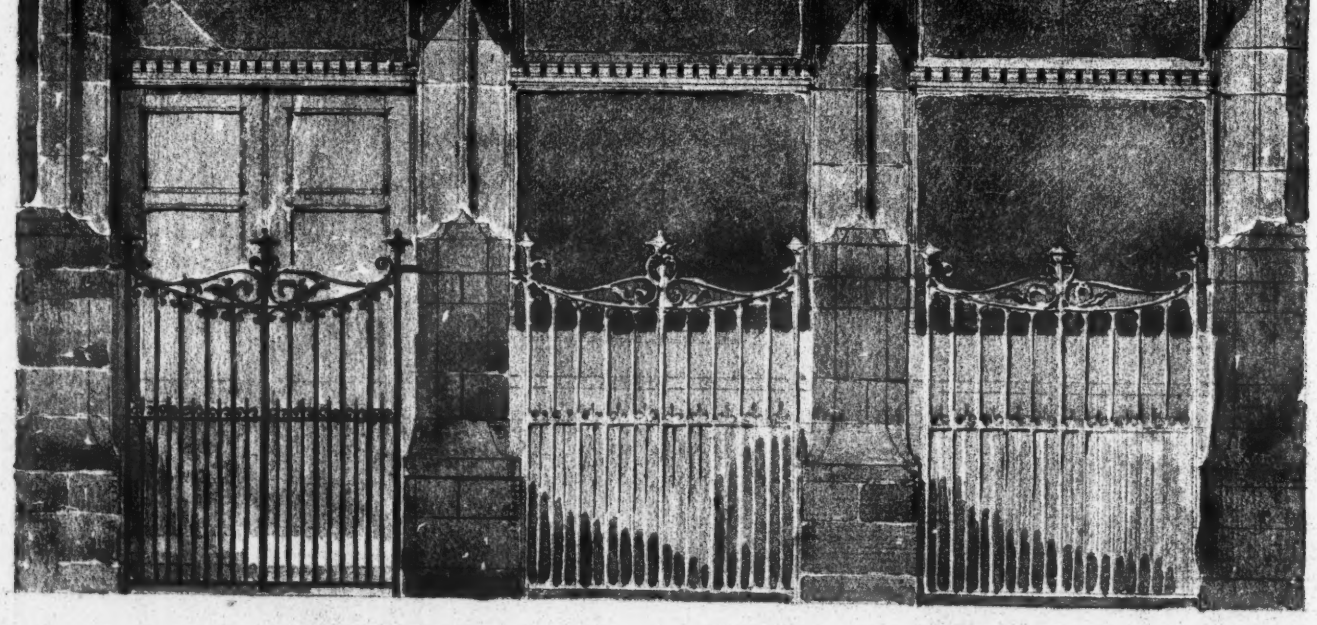

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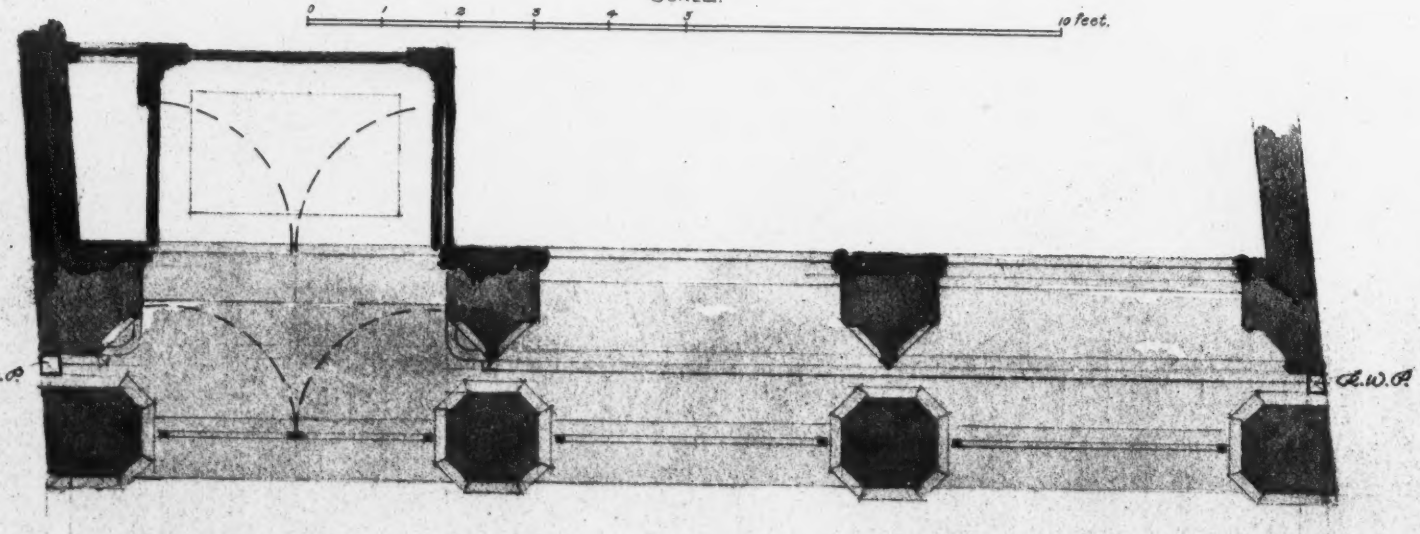

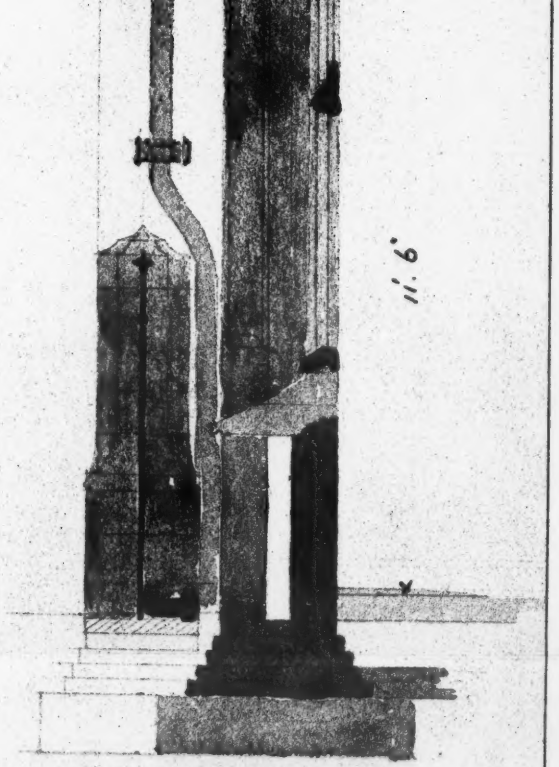

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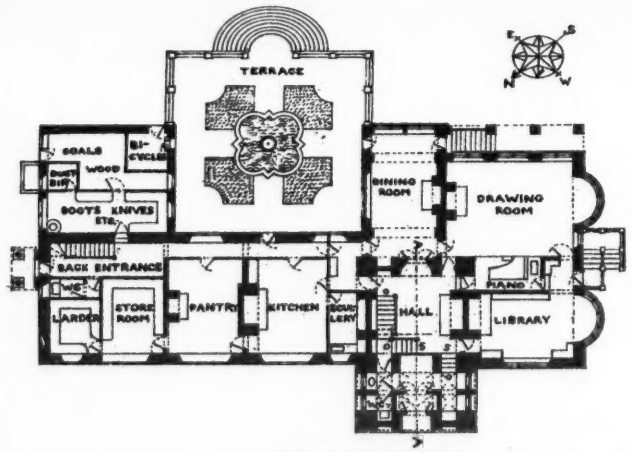

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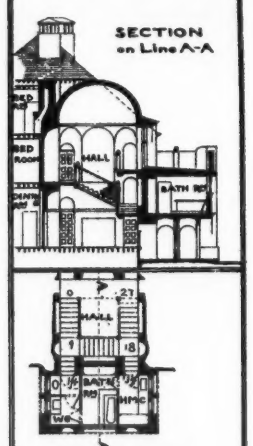

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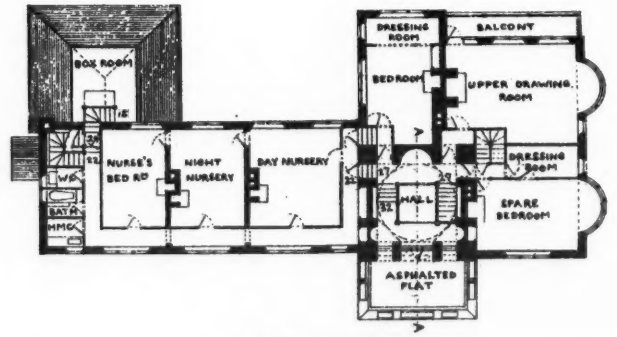

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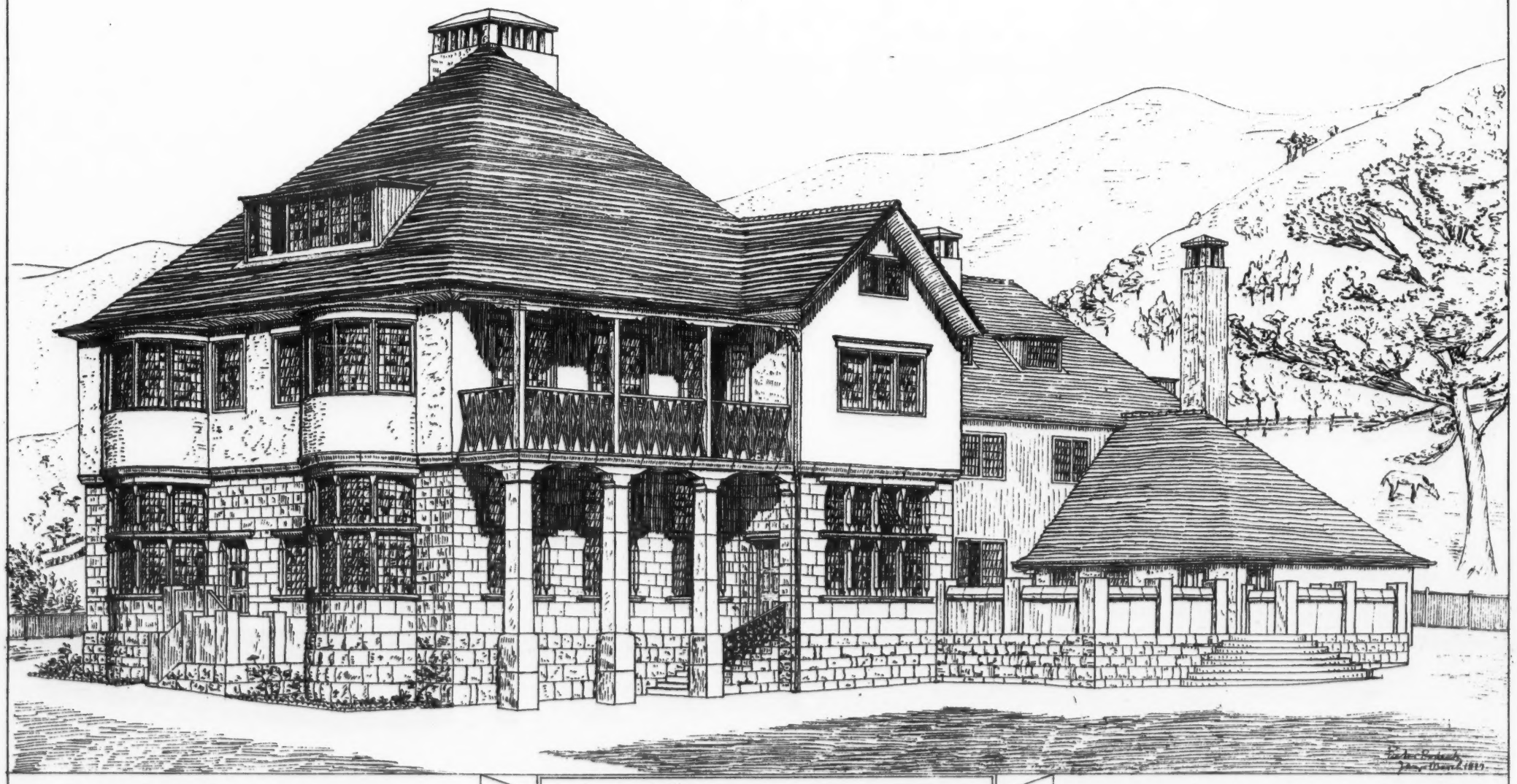

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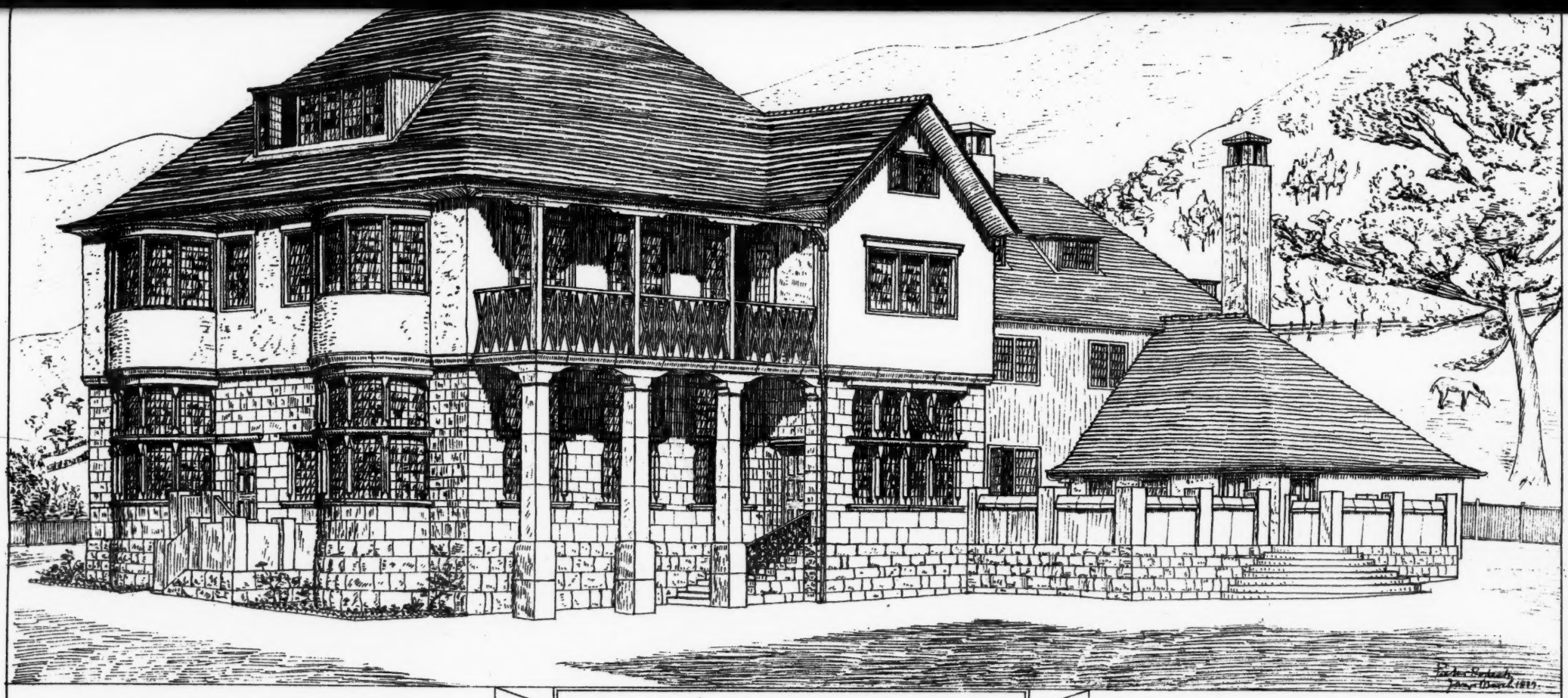

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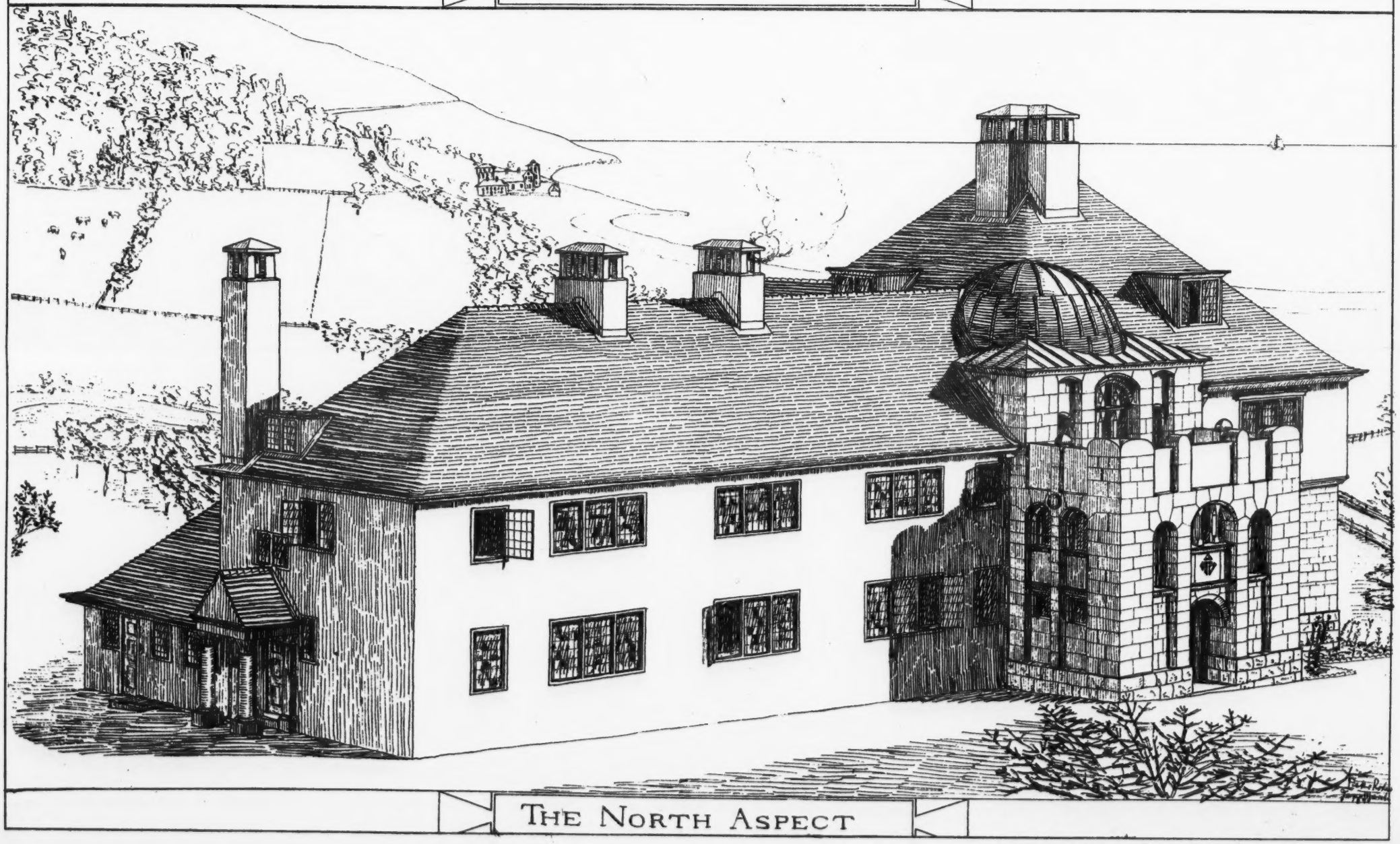

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